OSPREY COMBAT AIRCRAFT • 99

AV-8B HARRIER II UNITS OF OPERATION *IRAQI FREEDOM I-VI*

Lon Nordeen

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INTRODUCTION

After Operation *Desert Storm* in 1991, the AV-8B community went through a challenging period that saw the US Marine Corps reduce its light attack (VMA) force from six AV-8B day attack and two night attack squadrons to seven light attack units. The latter were equipped with a mix of AV-8B Night Attack and radar-equipped Harrier II+ aircraft.

At the same time the Marine Corps, the AV-8B STOVL (short-takeoff and vertical landing) community, Naval Air Systems Command and the US aerospace industry teamed together to overcome significant development issues with the improved Rolls-Royce Pegasus F402-RR-408 engine, manage serious safety and support challenges and maintain a viable growth plan. New features such as the Northrop Grumman AN/AAQ-28(V) Litening II precision targeting pod, video data downlinks, improved weapons (including the GBU-12 laser-guided bomb, GBU-51 reduced blast LGB, GBU-38 Joint Direct Attack Munition and AIM-120 Advanced Medium-Range Air-to-Air Missile) and better systems integration and tactics have kept the AV-8B viable.

Over the past 15 years the AV-8B community has been stretched to the limit providing air support during the War on Terror in both Iraq and Afghanistan, while at the same time fulfilling Marine Expeditionary Unit (MEU) deployment schedules, Asian forward deployment commitments and training requirements. The dedication of the Marine Corps to the continued need for the air-ground task force, as well as intense efforts by thousands of Marines, Sailors, Department of Defense civilians and aerospace industry professionals have allowed the AV-8B Harrier II to make a significant air support and intelligence, surveillance and reconnaissance (ISR) contribution to Coalition operations in Iraq. This included Operation *Southern Watch* support from 1996 through to 2003, the intense operations of Operation *Iraqi Freedom I* (2003) and the non-stop deployments to Iraq that followed from 2004 through to 2008.

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USMC AND AV-8B AIR SUPPORT

The US Marine Corps is a combined arms force with ground, combat support and aviation assets that train and fight together to conduct expeditionary manoeuvre warfare. Since the Marine Corps is essentially a light infantry force when compared to most armies, with the emphasis being on manoeuvre and assault from the sea, it relies on aerial firepower in the form of attack helicopters and tactical aircraft, such as the STOVL AV-8B (and conventional F/A-18A/C/D) to make up for the limited availability of organic artillery support. Indeed, the range, firepower and accuracy of weapons delivery offered by tactical aircraft are far superior to those achieved by artillery, naval gunfire and attack helicopters.

Operating the Marine Corps' principal tactical aircraft types, personnel within the Harrier II and Hornet communities have often endured a somewhat fractious relationship over the years. Both aviation programmes compete for limited funding, which is secured from the US Navy's budget. The Hornet is a superb multi-mission strike fighter that performs the air-to-air role and strike and reconnaissance missions. Squadrons equipped with the F/A-18A/C variant have directly supported the US Navy since the Hornet can operate from aircraft carriers. With both the US Navy and Marine Corps flying the F/A-18, fighter attack squadrons within the Marine Corps have benefited from US Navy support investments and upgrades to the aircraft over the past three decades.

The twin-engined Hornet is faster than the Harrier II, has a slightly greater range and can carry more ordnance for Close Air Support (CAS), depending on the mission and load configuration. It also has a much better safety record than the AV-8B, but requires a 6000 ft runway to operate from.

Although not flown by the US Navy, the AV-8B was seen as a special case 'Green machine' developed to provide CAS for Marine Corps ground forces by operating from amphibious assault ships and shorter airfields close to the battlefield. The Marine Corps had to often work through Congress in a series of 'budget wars' to secure funds for the AV-8B. Due to its unique vertical/short-takeoff and landing (V/STOL) flight characteristics, and associated design, the Harrier II was more challenging to fly, required more maintenance and had a significantly higher accident rate.

Multiple Marine Corps Hornet and Harrier II squadrons were committed to OIF in order to meet Marine Corps and Coalition air support requirements for the campaign. For the Marine Corps, US Army or Coalition soldiers on the ground in Iraq, the Hornet and Harrier II

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US Marine Corps AV-8B Harrier IIs have regularly deployed as a part of the aviation combat element of an MEU embarked in amphibious assault ships of the US Navy that have been assigned to an ESG. The latter usually composed of one 40,000-ton LHD/LHA (which carries most of the aircraft and more than half of the personnel and equipment of the MEU) and several smaller amphibious landing ships, plus an escort of frigates, destroyers and cruisers. This 2004 photograph shows USS *Essex* (LHD-2), USS *Fort McHenry* (LSD-43), USS *Germantown* (LSD-42) and USS *Juneau* (LPD-10). These vessels spent time assigned to Fifth Fleet during their 2004-05 cruise (*US Navy*)

provided effective and accurate air support, since both jets carried FLIR/laser targeting pods, cannon, rockets and precision-guided munitions, including laser-guided bombs, Maverick missiles and, later, Joint Direct Attack (JDAM) GPS weapons.

AV-8B units typically come under the control of the Marine Air-Ground Task Force (MAGTF) commander when deployed, being part of a force that can range in size from the small Marine Expeditionary Unit-Special Operations Capable (MEU-SOC) aboard three ships to a division-size (16,000+ personnel) Marine Expeditionary Force (MEF). Since the 1970s Marine Corps Harriers have regularly deployed as a part of the aviation combat element of a MEU-SOC embarked in amphibious assault ships assigned to an Expeditionary Strike Group (ESG). The latter usually consists of one 40,000-ton Landing Helicopter Dock (LHD) or 45,000-ton Landing Helicopter Assault (LHA) ship, which carries most of the aircraft and more than half of the personnel and equipment of the MEU-SOC, and two smaller amphibious landing ships.

Aviation combat elements are always part of a MAGTF, which includes a command element, ground force and combat support elements. The aviation element provides support for the 1200 Marines assigned to combat units of the three ships of the ESG. Generally, six Harrier IIs, nine pilots and about 90 support personnel from a Marine Corps Harrier II squadron are assigned to a composite squadron. This unit also includes a squadron of CH-46 medium lift helicopters or V-22 tilt-rotors, a detachment of CH-53 heavy lift helicopters and a smaller number of AH-1W Super Cobra attack helicopters, UH-1N liaison helicopters and several hundred support personnel and flight crews.

The AV-8B Harrier II provides unique capabilities since it is the only tactical aircraft forward deployed on amphibious assault ships that can support the full range of military operations due to its speed, firepower and basing options at sea or on short airstrips on land. Missions of the AV-8B Harrier II include attack and destruction of surface and air targets, helicopter escort, air defence and reconnaissance.

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The Marine Corps has long been a proponent of STOVL for CAS and strike operations. In 1969 it placed an order for the first of 110 AV-8A Harriers supplied from the UK by Hawker Siddeley, these aircraft subsequently equipping three frontline 'gun' squadrons and a training unit from 1971. Remaining in service until 1992, the AV-8As allowed Marine Corps aviation to gain valuable experience in STOVL operations, albeit at a high cost in both pilots and aircraft, through worldwide land-based deployments and 'blue water' flying from US Navy amphibious assault ships and aircraft carriers.

Throughout the 1980s and into the early 1990s the four AV-8A squadrons and five units equipped with the A-4M Skyhawk transitioned to the AV-8B Harrier II. This gave the Marine Corps an all-STOVL attack force composed of eight squadrons with 16-20 aircraft each, plus a large training squadron.

The second generation, higher performance AV-8B Harrier II day attack aircraft played a major role in Operations *Desert Shield* and *Desert Storm* (see *Osprey Combat Aircraft 90 – AV-8B Harrier II Units of Operations Desert Shield and Desert Storm* for further details). By August 1990, when Iraq invaded Kuwait, six Marine Corps VMA squadrons were fully equipped with the day attack version of the AV-8B, while VMAT-203 (the Harrier II training unit) operated a mix of AV-8Bs and TAV-8B two-seat trainers. The final two VMA squadrons (VMA-211 and VMA-214) were still in the process of converting from the A-4M to the AV-8B Night Attack Harrier II, however.

Harrier IIs from VMA-311 and VMA-542 were among the first tactical aircraft to be sent to the region in support of Operation *Desert Shield* following the invasion of Kuwait. Eventually, three AV-8B squadrons and a six-aeroplane detachment flew from airfields in Saudi Arabia while a fourth unit saw combat flying from USS *Nassau* (LHA-4) in support of Operation *Desert Storm*. Marine Corps pilots completed 3380 combat missions in the Harrier II and delivered 5.9 million pounds of high explosive bombs, cluster munitions and other ordnance. During the 41 days of intense strike operations against Iraqi forces, five AV-8Bs were lost in action to surface-to-air missiles/anti-aircraft artillery or operational causes, with two pilots killed and two taken prisoner.

Following the cessation of *Desert Storm* on 28 February 1991, the AV-8B Harrier II was highlighted as one of the operation's star performers. Nevertheless, advocates of the aircraft within the Marine Corps resolved to incorporate engine, systems, sensor and weapons updates necessary to make the Harrier II a key player for the future battlefield.

In the wake of *Desert Storm*, the ending of the Cold War led to a significant reduction in the size of the US armed forces. One of the Marine Corps' contributions to these cutbacks was the disbandment in 1992 of the first Harrier II squadron to be activated, VMA-331, based at Marine Corps Air Station (MCAS) Cherry Point, North Carolina. This left seven frontline squadrons with 20 AV-8Bs apiece and one large Harrier II training unit with more than 30 AV-8Bs/TAV-8Bs. A small number of Harrier IIs also served with the Naval Air Test and Evaluation Squadrons at Naval Air Weapons Station China Lake, California, and Naval Air Station Patuxent River, Maryland, as well as with the McDonnell Douglas (Boeing from 1997) factory in St Louis, Missouri.

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HARRIER II UPGRADES

Even before *Desert Shield/Desert Storm* the Marine Corps was moving forward with improvements for the AV-8B. With its electro-optical Hughes ASB-19 Angle Rate Bombing System (ARBS), the AV-8B day attack aircraft (161 produced) was essentially a clear air strike aircraft optimised for CAS. In June 1987 the first Harrier II Night Attack prototype (originally built as the 87th AV-8B) was rolled out, this variant being equipped with a Forward Looking Infrared (FLIR) sensor in the nose, an upgraded head-up display (HUD), a digital moving map, two-colour cockpit displays and cockpit lighting compatible with night vision goggles (NVGs). These improvements allowed AV-8B pilots to effectively fly and fight at night. In addition, the Night Attack Harrier II incorporated a larger Leading-Edge Root Extension (LERX), which improved agility. Four upward-firing chaff/flare dispensers were also added in the aft fuselage.

The USMC received the first of its 65 production AV-8B Night Attack aircraft in September 1989 (production aircraft 167 to 232), with initial deliveries going to Marine Corps squadrons located at MCAS Yuma, Arizona. Lt Col Russ Stromberg, who is now retired, was CO of VMA-214 when it became the first Marine Corps night attack squadron. He recalled;

'When we first got the Night Attack jets they were brand new aeroplanes. They gave us a lot more combat capability – the ability to fly and strike at night with the FLIR and NVGs, navigate using the moving map and the FLIR and communicate. The Night Attack jet had the capability to send and receive a 9-line brief using the Automatic Target Handoff System (ATHS), which employed the Universal Transverse Mercanian (UTM) – the same system ground commanders and FACs use. These additions, combined with the improved engine performance of the AV-8B and its ability to strike at night with the FLIR and NVGs and communicate (via ATHS) for air support in the same language, really sold the ground combat element on the Night Attack Harrier II.'

In this Boeing photograph the more advanced versions of the AV-8B – the Harrier II+ (116 built for the Marine Corps), equipped with the AN/APG-65 radar and Forward-Looking Infrared Sensor (FLIR), and the Night Attack Harrier II (66 built for the Marine Corps), fitted with a FLIR and an ARBS – have been posed side-by-side. Both variants are powered by the Rolls-Royce F402-RR-408 turbofan engine, which provides increased thrust over the F402-RR-406 fitted in the original AV-8B (*Boeing*)

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The cockpit of the AV-8B Harrier II+, which includes two Honeywell CRT displays (the non-radar Night Attack aircraft has only one CRT, to the left), a centre-mounted communication-navigation keypad and a Smiths HUD, plus back-up instruments. The Harrier II's Stencel S-III-S SJU-4 ejection seat is also well illustrated from this unusual angle (*Ted Carlson/Fotodynamics*)

In 1990 the AV-8B Night Attack airframe commenced flight testing with the F402-RR-408 engine, which not only provided 3000 lbs of additional thrust but was also meant to be more durable than the F402-RR-406 fitted in the original Harrier II. However, the higher thrust engine experienced a series of technical challenges that resulted in the crash of several aircraft and a fleet-wide grounding of all AV-8Bs. These problems adversely impacted fleet operations and training until Rolls-Royce corrected bearing and blade issues. The F402-RR-408 engine was eventually retrofitted into all Marine Corps Night Attack aircraft, as well as TAV-8B trainers and later Harrier II+ jets.

In September 1990 the USA, Spain and Italy agreed to fund the integration of the Hughes (now Raytheon) AN/APG-65 multi-mode radar, F401-RR-408 engine and other systems enhancements into a new version of the Harrier II. Designated the AV-8B Harrier II+, the jet was now capable of performing as an air defence fighter, precision bomber and reconnaissance aircraft all in the same mission. The US Navy funded the production of 42 brand new Harrier II+s (production aircraft 233 to 262, and BuNo 164129, which was a radar integration test conversion from a Night Attack aircraft) and the remanufacture of 74 AV-8B day attack aircraft (production aircraft 263 to 336) to Harrier II+ configuration. Production of the new/remanufactured aircraft ran from 1996 through to late 2003, when the final Harrier II+s for the Marine Corps and Spain were delivered.

Jackie Jackson, Boeing's Chief Test Pilot for the AV-8B, performed myriad flights in all three versions of the Harrier II. He noted;

'The Harrier II+, with its radar and FLIR, brought a huge increase in combat capability. The addition of these systems slightly increased the jet's drag and weight, but there really was not much difference in performance between the -408-powered Night Attack aircraft and the radar-equipped Harrier II+. Where you saw a bit of a difference was in turning, but we made up most of that by introducing the bigger LERX. The V-max [maximum speed] was nearly the same, with the Night Attack jet perhaps being 5-8 knots faster.'

For within visual range air combat, Harrier II pilots could also utilise the IR-guided AIM-9L/M Sidewinder and 25 mm cannon. Integration of the AN/APG-65 multi-mode radar and AIM-120 AMRAAM radar-guided air-to-air missile into Spanish, Italian and Marine Corps Harrier IIs dramatically improved the air combat capability of the aircraft. For navigation and surface attack, the radar provided long-range surface mapping and weapons delivery modes.

The Harrier programme has always been controversial due to its unique V/STOL and STOVL performance and higher than average loss rate.

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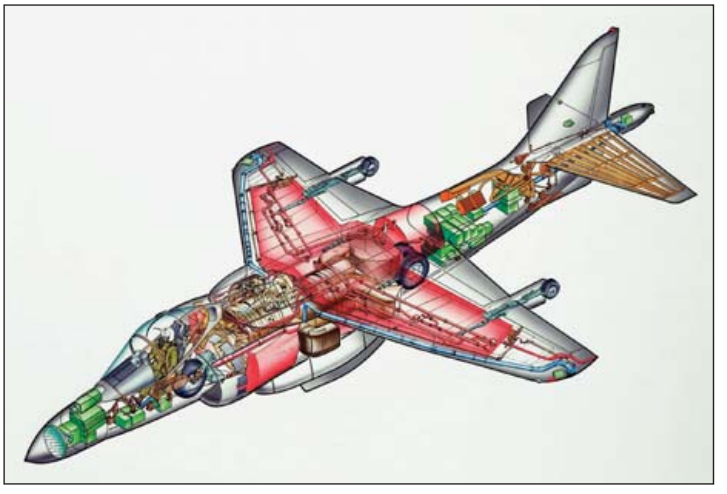

Created by Boeing, this cutaway artwork of the Harrier II+ clearly shows the aircraft's key features – the AN/APG-65 radar and FLIR in the nose (illustrated in green). Another new addition to the later versions of the AV-8B (including the Night Attack variant) are the four upward-firing chaff/flare dispensers built into the aft fuselage (illustrated in orange) (*Boeing*)

In the 1980s and early 1990s many AV-8Bs were lost due to a variety of causes including pilot error, engine and systems failures, weather and maintenance issues. In an effort to counter this alarming loss rate, in the 1990s the Marine Corps, US Navy and the aerospace industry developed a comprehensive programme that would identify Harrier II issues and instigate corrective actions necessary to improve support and safety. Progress in these areas would be reviewed at an annual symposium. The substantial investment made by the Marine Corps, US Navy and defence contractors into improved engineering, support and training turned the AV-8B's loss rate around, leaving the Harrier II ready to play a significant role in future operations across the globe.

In the late 1990s Lt Col Robert Claypool and a team of Marine Corps staff officers convinced Lt Gen Frederick McCorkle, Deputy Chief of Staff (DCS) Aviation, to sign an urgent combat capability requirement for an up-to-date FLIR to be integrated with the AV-8B. Crucially, they also secured supplemental funding from Congress for this update. After testing the available targeting pods it was determined that the AN/AAQ-28(V) Northrop Grumman Litening II FLIR/laser designation pod was more capable, cost less and was easier to integrate into the AV-8B than other alternatives, and thus was selected. By 2000 an AV-8B with the Litening II pod mounted on underwing station five, and incorporating modified software, was being tested.

The pod allowed Harrier II pilots to detect and track targets with enhanced precision, greatly reducing the risk of collateral damage, and deliver precision laser-guided bombs from above the range of anti-aircraft fire and shoulder-launched IR-guided surface-to-air missiles – the latter had proven to be lethal in *Desert Storm* (when they downed at least four Harrier IIs) and other conflicts. AV-8B Litening II pods were eventually modified with a data link for real time transmission of imagery to ground stations. This new capability was to revolutionise battlefield command and control, and make the AV-8B a much-prized intelligence, surveillance and reconnaissance strike platform.

By late 2002 all seven of the Marine Corps' frontline Harrier II squadrons were equipped with 15 AV-8Bs – usually a mix of ten to twelve radar-equipped Harrier II+s and four to six AV-8B Night Attack aircraft.

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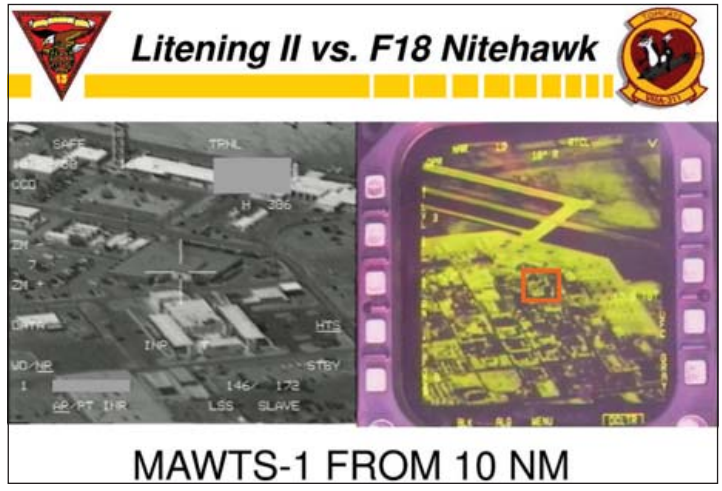
The AN/AAQ-28(V) Northrop Grumman Litening II FLIR/laser designation pod was integrated with USAF F-16s in the late 1990s and accepted for service with Marine Corps AV-8Bs from August 2000. The pod completed its testing phase with NAVAIR shortly thereafter, and frontline units were issued with examples several months prior to OIF I. The Litening II pod includes a charge-coupled device television camera and FLIR systems and a laser spot tracker/rangefinder. Imagery viewed by the pod is shown on the cockpit CRTs, which allows the pilot to detect and identify targets and employ LGBs with clinical accuracy. In late 2002 the Litening II pod was fitted with a video data link so that the image seen by the pilot could be transmitted to a laptop computer on the ground fitted with an antenna. The real time imagery generated by this system greatly improved strike effectiveness, since the FAC could monitor the aerial attack from the ground as if he was sitting in the cockpit with the pilot (*Northrop Grumman*)

The Marine Corps' investment in the higher thrust Pegasus F402-RR-408 engine and improved safety, support and training was about to pay off. Another plus was the procurement of six to eight Litening II targeting pods for each Harrier II squadron, which allowed pilots to identify tactical targets from medium altitudes.

Aside from the Litening II, the Marine Corps had also acquired additional equipment to enhance the AV-8B's strike effectiveness. The latter included a Global Positioning System (GPS) and the ATHS, which provided the digital exchange of targeting data and imagery between the jet's targeting pod and ground units equipped with a Remote Operational Video Enhanced Receiver (ROVER). The installation of new wiring also allowed the Litening II pod to be carried on centreline station four rather than underwing station five, thus widening the sensor's view of the ground. The freeing up of the underwing pylon also allowed additional ordnance or fuel to be carried by the Harrier II.

Continuous software upgrades were also developed and incorporated into the AV-8B's weapons system. This included many Operational Flight Program (OFP) updates ranging from C1.0 in 1999 to C2.0 in 2003, H4.0 in 2006 and H5.0 and H6.0 in 2008. These software upgrades improved the operability of the AN/APG-65 radar and Litening II pod when it came to weapons integration with the many versions of JDAM (including Laser JDAM), the dual mode laser/GPS guided bomb and AIM-120 radar-guided air-to-air missile. The software also created new digital data links that allowed the Harrier II to work more closely with other aerial (both manned and unmanned) and land-based assets. All of these upgrades would be put to the test in the War on Terror from 2002.



This graphic, created by VMA-311 post-OIF I as a briefing slide for Marine Aviation Weapons and Tactics Squadron 1, shows the quality of the CRT picture in the cockpit of a Litening II-equipped AV-8B. The view of the same target, from an identical distance, offered to the pilot of an F/A-18 equipped with a Lockheed Martin AN/AAS-38 Nite Hawk targeting pod is considerably poorer (*via Lt Col Mike Hile*)

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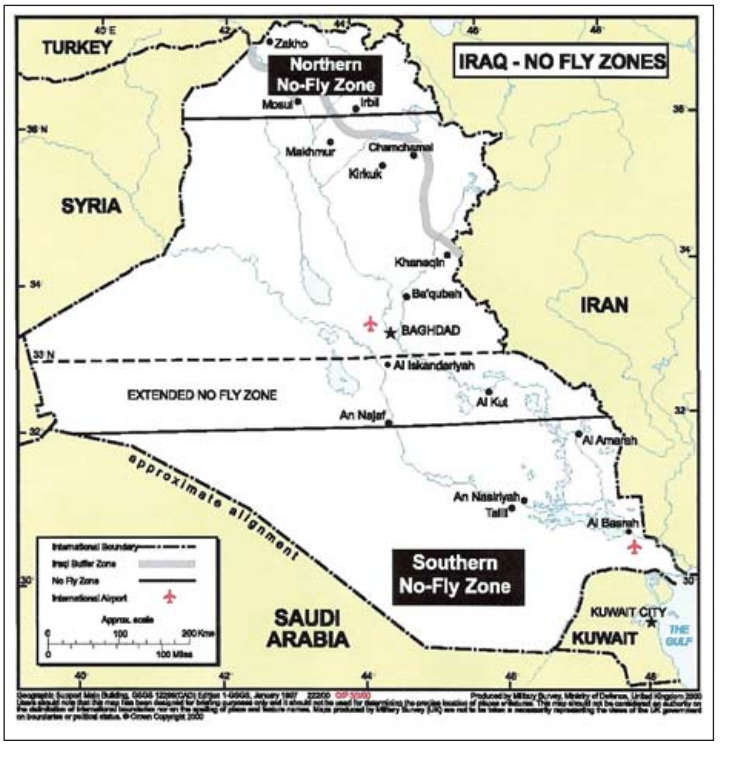
OPERATION *SOUTHERN WATCH*

Following the end of the 1991 war, Iraqi forces attacked the Kurds in the north and Shiite population in the south as they used the Coalition victory in Kuwait to rise up against President Saddam Hussein and his ruling Ba'ath Party. Troops, supported by fixed-wing ground attack aircraft and helicopters, were employed to brutally reassert the regime's authority in these regions. The United Nations (UN) passed Resolution 688 in April 1991 demanding an end to these attacks, and the USA sent supplies to the Kurds as part of Operation *Provide Comfort*.

US Central Command (CENTCOM) established the Joint Task Force-South West Asia (JTF-SWA) on 26 August 1992 to enforce the UN No-Fly zones, the patrolling of these areas being codenamed Operations *Northern* and *Southern Watch* – the USA, United Kingdom, France and Saudi Arabia initially contributed aircraft to enforce the No-Fly zones. In late 1992 Iraqi forces began firing back at Coalition sorties flying over Iraq. These engagements culminated in a USAF F-16 shooting down an Iraqi Air Force (IrAF) MiG-25 on 27 December 1992. Air strikes were also periodically flown against Iraqi air defences and other regime targets. By 1997, some 28,800 sorties had been flown over southern Iraq alone, with about 90 per cent of these missions being undertaken by USAF, US Navy and US Marine Corps aircraft.

Marine Corps AV-8B Harrier IIs assigned to the air combat element of MEU-SOCs sailing in the Arabian Gulf flew missions over southern Iraq in support of OSW. The first of these was conducted in January 1996 when AV-8Bs from VMA-311 Detachment A, assigned to 15th MEU-SOC's HMM-268 embarked in USS *Peleliu* (LHA-5), joined other US aircraft for Operation *Southern Watch* (OSW) patrols.

One of the pilots involved in these missions was Col Chris McPhillips, who recalled;



This map of Iraq, generated by the British Ministry of Defence and issued to defence journalists in 2000, reveals the Northern and Southern No-Fly Zones that were put in place over the country by the United Nations and enforced by US, British and French tactical and support aircraft. More than 100,000 ONW and OSW sorties were flown between 1992 and 2003 (*via Author*)

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AV-8B Night Attack BuNo 163675 of VMA-311 Detachment A, 15th MEU-SOC/HMM-268 embarked in USS *Peleliu* (LHA-5) provides the backdrop for this photograph of Capts Brad Gering, Paul Simmons and Chris McPhillips. These men were among the first Harrier II pilots to fly missions in support of OSW in January 1996. LHA-5 deployed to the NAG in late 1995, after which air and ground elements of 15th MEU-SOC participated in training with the Kuwaiti armed forces. The six AV-8Bs of 'Det A' flew ashore to Ali-Al-Salem air base, from where they mounted sorties in support of OSW in coordination with USAF A-10As. This Harrier II is armed with an interesting combination of AGM-65 Maverick air-to-surface missiles, AGM-122 Sidearm anti-radiation missiles and AIM-9M air-to-air missiles (*Col Chris McPhillips*)

The pilots of VMA-211 Detachment A, 11th MEU-SOC/HMM-166 pose together on the flightdeck of USS *Essex* (LHD-2) during the vessel's 1996-97 deployment – the vessel spent a considerable amount of time assigned to Fifth Fleet, sailing in the Northern Arabian Gulf. 'Det A' went ashore to Ahmed Al Jaber to fly OSW missions while the carrier patrolled off the coast. These pilots are, in the back row, from left to right, Capts David McCann, Greg Stankewicz, Michel Gough, Vance Cryer and Steve Quintara, and in the front row, from left to right, Capt John Cane, Maj Todd Schland, Maj Clyde Woltman and Capt Sean Godley (*Lt Col Vance Cryer*)

'We went to the CENTCOM AOR [Area Of Operations] as part of a normal deployment. When we arrived in the Gulf, the boat went to Kuwait and we flew ashore with six jets and operated out of Ali-Al-Salem air base in Kuwait for several weeks in support of OSW. I was a new captain on my first deployment, and as the junior guy OSW was my first combat experience.

'At the time Ali-Al-Salem was still a mess, strewn with mines and wreckage from the Gulf War. We parked alongside some Kuwait Air Force [KAF] F/A-18s.

'As the Night Attack guys we flew with NVGs and the Nav FLIR at night a lot, doing visual reconnaissance patrols looking for trucks and military activity. Our ordnance included IR Mavericks, AIM-9s and the AGM-122 Sidearm ARM [Anti-Radar Missile, based on remanufactured AIM-9C Sidewinder] for self-defence. We did not drop anything because the ROE [Rules Of Engagement] said we had to be fired on first. Sometimes we would fly with a section of A-10As, which was interesting, as they were so slow it was tough just flying in formation with them.'

Some AV-8B OSW sorties were flown from the ship, but frequently the detachment operated from forward bases in Kuwait, namely Ali-Al-Salem or Ahmed Al Jaber. Harrier II pilots would usually fly one or two familiarisation flights over the Kuwait-Iraq border area to become familiar with mission rules and tactics. After that they were assigned OSW missions that could see them sent as far as 250 nautical miles into Iraqi airspace under the control of JTF-SWA, which was then located in Riyadh, Saudi Arabia.

On a typical OSW air patrol, a flight of two or more AV-8Bs would take off from their amphibious assault ship or forward base in Kuwait equipped with two external fuel tanks and a mix of air-to-ground bombs (typically two Mk 82 500-lb dumb bombs or CBU-89 Gator cluster bombs) and AIM-9M Sidewinder air-to-air

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missiles for self-defence. After takeoff the Harrier II pilots would rendezvous with an aerial tanker (US Navy S-3B, USAF KC-135 or KC-10 or RAF Tristar or VC10) and fill up, before starting their patrol or air interdiction mission in concert with other Coalition aircraft.

Many Harrier II OSW missions were flown over the Basra area of Iraq, which included numerous active air defence sites. Most OSW sorties were routine, but occasionally the flights were engaged by radars or fired upon by missiles or AAA, making life a little more interesting for the pilots. The Harrier II has a video recording system, and the six-times magnification power of the ARBS and HUD video imagery provided excellent footage of Iraqi targets and points of interest. On the return flight Harrier II pilots would again meet refuelling tankers for a top-off before the long flight back to Kuwait or the Northern Arabian Gulf (NAG) for a vertical landing on the ship.

In 1996-97, Col Clyde Woltman (ret.), who was then a major, was officer-in-charge (OIC) of VMA-211 Detachment A as part of HMM-166's 11th MEU-SOC deployment aboard USS *Essex* (LHD-2). He remarked;

'We left San Diego in October 1996 and two months later flew several dozen OSW missions. We also exercised with the KAF. We conducted all of our OSW operations from Ahmed Al Jaber after disembarking from the *Essex*. The A-10s and other USAF assets in-country were located at Ali-Al-Salem air base in southern Kuwait. Although that facility was in far better shape than our airfield, we took what we could get as we needed the flexibility of shore-based operations. We were co-located with our KAF F/A-18 brothers, so we did a lot of air-to-air training as well as OSW missions.

'Our AOR was typically along the Kuwait-Iraq border up to, and around, Basra. This was so close to our base that we did not have to deal with tankers when aloft. We never got to drop any weapons. The unit mainly sent two-ship flights into Iraq, and we also flew the occasional three-ship when the jets were available. Our primary mission in OSW was target recognition and intel for CENTCOM on ground positions.

'Aside from our OSW commitments, we also had a specific training syllabus that we needed to carry out. As the OIC lead, it was my job to manage this training. Being the "old guy" in the detachment, I was also the air combat tactics instructor [ACTI]. We had four pilots working towards being certified as ACTIs and weapons tactics instructors (WTIs), so we flew a lot of training sorties on the way to the Persian Gulf. We got some good training with the F-15As of the Hawaiian Air National Guard (ANG) en route to the Middle East, and were then visited by a Marine Aviation Weapons and Tactics Squadron (MAWTS) instructor in Kuwait while we were there. As previously mentioned, we also routinely trained with KAF F/A-18s.

'We focused on very specific goal-oriented training both on the ship and when deployed in Kuwait, while at the same time flying OSW missions – it was great duty! Although our AV-8B Night Attack aircraft had no radar for air-to-air operations, we held our own in air combat training nevertheless.'

Even with the UN mandate, US-led operations against Iraq became increasingly unpopular to the point where Russian and Arab governments began to voice their opposition to OSW from the mid-1990s. Although American ground forces remained in Kuwait, supported by 200 aircraft

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VMA-211 returned to OSW duties in early 1998 when Detachment A went ashore to Ali-Al-Salem from USS *Tarawa* (LHA-1) while the rest of 11th MEU-SOC/HMM-268 exercised in Kuwait. In this photograph, taken on 29 March 1998, a detachment maintainer has borrowed a USAF missile-loading tractor to transport four AIM-9M Sidewinders out to the VMA-211 dispersal area (*US Marine Corps*)

in the Arabian Gulf region, after 1996 the latter could not fly from Saudi Arabian air bases. The French withdrew all of their aircraft from OSW operations in 1997. Undeterred, the US government remained committed to enforcing the southern No-Fly Zone.

During the periods when combat activity in the region intensified, following the foiled assassination attempt on former President George H W Bush during a visit to Kuwait in June 1993 or Operation *Desert Strik*e in September 1996, for example, precision strikes were performed by ship- and air-launched Tomahawk cruise missiles, rather than manned aircraft. Despite the Clinton administration's preference for unmanned strikes on air defence targets in Iraq, the US Navy continued to regularly deploy aircraft carriers and amphibious-ready groups into the NAG, and these forces were assigned ongoing OSW operations.

In early 1998 VMA-513's Detachment A, led by Maj Dale Willey, became the first AV-8B unit to be trained up in the use of then new third generation NVGs for shipboard takeoffs and landings prior to deploying operationally later that year. Previously, a pilot would take off unaided at night, climb above 3000 ft and then don the goggles. Similar 'doffing' occurred upon recovery to the ship, and prior to penetration for an Instrument Flight Rules approach. The NVGs greatly enhanced safety around the boat, speed of launch, formation join ups and recovery. This NVG launch and recovery capability would subsequently become crucial for ambitious 'Harrier Carrier' night deck-cycles during Operation *Iraqi Freedom* (OIF) in 2003, allowing for greatly increased sortie throughput during the hours of darkness.

The 15th MEU-SOC embarked in *Essex* left San Diego on 22 June 1998 for a six-month deployment. By 20 September the vessel was operating off Kuwait, the AV-8B Night Attack jets of VMA-513 Detachment A flying OSW missions in concert with US Navy F/A-18Cs and F-14Ds from Carrier Air Wing 14, aboard USS *Abraham Lincoln* (CVN-72). Harrier II pilots also flew CAS training missions over bombing ranges in Kuwait from Ali-Al-Salem air base. In mid November *Essex* and 15th MEU-SOC departed the NAG and returned to San Diego.

Amongst the pilots assigned to VMA-513 Detachment A was then Capt (now Lt Col) Marcus Annibale, who recalled;

'This was my second back-to-back deployment with the 15th MEU-SOC, and I was eager to prove my newly earned flight-leadership qualifications. I remember getting the chance to lead a division of four Harrier IIs over Iraq on an OSW on my birthday. These missions were considered combat, and they were a bit of a "cat-and-mouse" game – more like a "cat-and-rat" game, where we played the "Big Cat" and Saddam's SAM operators and AAA gunners were the "Rats" that would bite your tail with a SAM up your tail-pipe if you got complacent over the No-Fly Zone.

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'We were part of a large strike package centred on the carrier air wing aboard *Abraham Lincoln*. After pre-mission tanking and comms checks on our secure radios – always a challenge – we formed a "gorilla-formation" separated by altitude blocks and ingressed across the shoreline "feet-dry" for Iraq. The F-14 Tomcats [of VF-31] were sweeping out the high-blocks before us while F/A-18s [from VFA-25, VFA-113 and VFA-115] were loaded with LGBs, as well as an air-to-air missile load out.

Capt Jay Schnelle of VMA-513 Detachment A undertakes a training sortie in preparation for an OSW mission in October 1998. Flying from Ali-Al-Salem, six Harrier IIs of 'Det A' had come ashore from LHD-2. The bridge in the background was destroyed during Operation *Desert Storm* (*Lt Col Marcus Annibale*)

'Our Harrier IIs formed an arm that headed for our assigned targets north of Basra. Of course our Master Arm switches remained off unless directed otherwise by JTF-SWA. Our "targets" were Iraqi Republican Guard barracks, armour and headquarters, and our jets were armed with CBU-99 cluster bombs, AIM-9M Sidewinders and AGM-65F IR Mavericks. We executed a ramp-down profile from an action-point, allowing our then relatively poor sensors – nose cameras, Dual Mode Trackers and the seeker head in the IR Mavericks – to have a long stare time to sort out our individually assigned target sets. I still remember how humid, dusty and poor the visibility could be.

'Equally important to our patrolling and presence was capturing imagery on our tapes for intelligence debriefs, confirming targets and sorting out any "buggery" on the ground by the Iraqis. After rejoining off-target, we climbed and crossed back "feet-wet" out to the Gulf for some post-mission tanking. Prior to returning to "mother" – *Essex* – on my birthday mission, we formed up for a parade formation photo-op. I fondly remember posing for the camera chomping on a cigar, although it was tough to see it in the final photo unless I pointed it out. It was a great birthday for sure!'

Lt Col Joseph Williams was another AV-8B pilot to complete OSW missions during the early stage of his career flying the aircraft;

'On my first tour with VMA-214, I was part of the squadron's Detachment A assigned to HMM-364 and the 13th MEU-SOC embarked in USS *Boxer* (LHD-4) from December 1998 through to June 1999. We had six AV-8B Night Attack aeroplanes, all with the ARBS. Although our primary mission within the MEU-SOC was to support the battalion with CAS, we also undertook helicopter escort in the event of evacuations, disaster relief or air assaults, providing overwatch, radio relay etc.

'Back then, during my early tours with the Harrier II, it was a totally different aeroplane. We could only deliver Mk 80 series unguided bombs in dive attack operations using the ARBS, or employ IR Mavericks. We also had the gun. There was no targeting pod to ensure precision strikes, and radar-equipped jets were still being introduced into the fleet. Our Night Attack aircraft had been fitted with ARC-210 radios with Have Quick capability, however, and GPS had just been phased in. Nevertheless, our AV-8Bs were still non-precision employment assets.

'We sailed from San Diego in December 1998, and like other Harrier II units before us, we trained with the Hawaiian ANG F-15s during our transit to the Middle East. Once in the Arabian Gulf the MEU-SOC exercised with assets from the United Arab Emirates and Kuwait. We

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Capt Kelly Ramshur receives fuel from an S-3B Viking of VS-35, operating from USS *Abraham Lincoln* (CVN-72) in the NAG, during an OSW mission in late 1998. VMA-513 'Det A' provided aircraft for large strike packages that CVW-14, embarked in CVN-72, sent into the No-Fly Zone on a near-daily basis. Interestingly, the S-3 is armed with an AGM-84E Harpoon anti-ship missile. Vikings in the NAG typically carried out two roles in a single mission – sea-search for vessels carrying contraband into the Iraqi port of Basra and aerial refuelling for OSW strike package jets (*Lt Col Marcus Annibale*)

went to Ali-Al-Salem and operated alongside KAF Hornets, some of which were flown by ex-Marine Corps pilots. HMS *Invincible* was also in the region at the time supporting OSW, so we flew our jets aboard the vessel and trained with 800 Naval Air Squadron, which was equipped with Sea Harrier FA 2s. We enjoyed a lot of good training exercises with different countries and services during that deployment.'

No-Fly Zone enforcement sorties, including AV-8B missions, continued, and between January 1999 and March 2003 Iraqi air defence sites tracked and fired on US and British aircraft more than 1500 times. On a number of occasions following the four-day Operation *Desert Fox* offensive in December 1998, which was ostensibly aimed at curbing Iraq's ability to produce weapons of mass destruction following the expulsion of the UN weapons inspection team, Coalition jets fired back with AGM-88 High-speed Anti-Radiation Missiles. Air defence positions and communications nodes within the southern No-Fly Zone, were also regularly bombed. These armed confrontations continued until early 2003, with Iraqi defences downing a number of unmanned aerial vehicles (UAVs) but no manned aircraft.

In the spring of 2002, with the Taleban regime removed from power in Afghanistan following Operation *Enduring Freedom*, the US and British governments turned their attention to Iraq once again. This time President George W Bush and Prime Minister Tony Blair decided that permanent regime change was necessary following reports, which ultimately proved to be erroneous, that Saddam was developing weapons of mass destruction. From the autumn of that year units began to move into position for an invasion in early 2003. Prior to this, between July 2002 and 19 March 2003, US and British units in-theatre stepped up their operational tempo and flew some 8600 sorties over Iraq and conducted hundreds of air strikes on targets in the No-Fly Zone. Iraqi air defence sites bore the brunt of this pre-war offensive, Coalition aircraft striking at known anti-aircraft artillery, missile and command-and-control positions that were seen to pose a threat to the ground invasion.

CENTCOM, commanded by Gen Tommy R Franks, had been working on an Iraq assault plan since early 2002. Initially, it called for drives toward Baghdad from Turkey in the north and Kuwait in the south, the invasion involving 250,000 US Army, Marine Corps and British troops supported by heavy air power. A key component of this force were the 70,000 Marines assigned to I MEF, which was composed of the 1st Marine Division (three regimental combat teams), the 2nd Marine Expeditionary Brigade (MEB), the 3rd Marine Aircraft Wing (MAW) and supporting units.

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The plan called for the US Army's 4th Infantry Division to attack south from Turkey, the 3rd Infantry Division to drive north from Kuwait toward Baghdad on a western route and the 1st Marine Division to drive north from Kuwait on an eastern route. The 101st Airborne Division and 2nd MEB (Task Force South) would take over as forces advanced, while the British 1st Armoured Division secured areas around Basra. This plan was eventually abandoned, however, when the Turkish government refused to allow US troops into its country.

The Marine Corps' move to war involved 20 amphibious vessels and 11 maritime pre-positioned ships, which started departing US ports in January 2003. Once the troops had been offloaded in Kuwait, AV-8B units aboard USS *Bataan* (LHD-5), USS *Bonhomme Richard* (LHD-6) and USS *Kearsarge* (LHD-3) restructured for operations in support of OIF. 24th MEU-SOC, embarked in USS *Nassau* (LHA-4), was already deployed to the region, and 15th MEU-SOC, aboard USS *Tarawa* (LHA-2), departed from San Diego for the Arabian Gulf on 6 January 2003. USS *Saipan* (LHA-2) was also committed to OIF, but the vessel operated exclusively as a helicopter carrier.

Elements from four Marine Corps Harrier II squadrons (VMA-211, VMA-223, VMA-311 and VMA-542) were deployed on the amphibious assault vessels, these aircraft being assigned to Marine Air Group (MAG) 13. The ship-based AV-8Bs made up nearly half of 3rd MAW's tactical air (TACAIR) support for OIF.

Marine Corps air assets were under the control of Maj Gen James F Amos, CO of 3rd MAW. The wing's 451 aircraft and 15,451 Marines were based at Ali-Al-Salem, Ahmed Al Jaber and 15 other sites, including ships and forward operating bases (FOBs). Major 3rd MAW elements included MAG-13 (led by Col Mark Savarese) with five AV-8B squadrons and Marine Logistics Squadron 13, MAG-11 with F/A-18s, EA-6Bs, C-130s and logistics squadrons, MAG-16, MAG-29, MAG-37 and MAG-39 with helicopters (CH-53s, CH-46s, AH-1Ws and UH-1Ns) and MACG-38 with 'C3I' (Command, Control, Communications and Intelligence), air defence and support.

A group shot of pilots from VMA-513 'Det A' in 1998-99. They are, from left to right, standing, Maj Thomas Carnesi and Capts Marcus Annibale, Jim Murphy, James Hurd and John Rahe. Squatting, from left to right, are Maj Steven Dunkin, Capt Kelly Ramshur, Maj Dale Willey and Capt James Schnelle. Commenting on the unique paint scheme on the jet in the background to this photograph, now Lt Col Marcus Annibale explained, 'The camels painted beneath the cockpit of the jet denoted a mission "in the container" [No-Fly Zone] for OSW. You can also see a typical OSW mission load-out on the jet – CBUs, drop tanks and AIM-9s. This particular Harrier had a sharksmouth on its nose. I think it was the only machine marked like this in "Det A". We were attached to HMM-163, also know as the "Evil Eyes", whilst aboard *Tarawa*, so all the jets had the eyes painted on them – we added a sharksmouth to this one, and the Marines loved it!' (*Lt Col Marcus Annibale*)

More than 40 per cent of the Marine Corps' TACAIR assets assigned to provide support for I MEF in OIF I operated from these amphibious assault ships, which together formed Task Force 51. Marking the first time that six large-deck amphibious assault ships had sailed in the same area of operations, this unique moment in history was captured during a specially arranged photo-call in the NAG in April 2003. Leading the vessels is USS *Tarawa* (LHA-1), with USS *Kearsarge* (LHD-3) off its starboard side and USS *Saipan* (LHA-2) to port. The remaining trio of vessels are, from top to bottom, USS *Bonhomme Richard* (LHD-6), USS *Bataan* (LHD-5) and USS *Boxer* (LHD-4) (*US Navy*)

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OIF I – VMA-214

In addition to the 60 Harrier IIs deployed aboard amphibious ships, 16 AV-8Bs from VMA-214 (and support personnel) were sent to Ahmed Al Jaber air base in February 2003. First established in 1942 as Marine Fighter Squadron 214, the famous 'Black Sheep' associated with World War 2 ace Maj Gregory 'Pappy' Boyington and the F4U Corsair was the first unit to convert to the AV-8B Night Attack aircraft in late 1989.

The squadron was led to Kuwait by Lt Col Robert Claypool, who had assumed command of VMA-214 in September 2002;

'We had a pretty good idea war was coming soon. There was some discussion about whether we would go since at the time I had a squadron minus six aeroplanes, nine pilots and 80 Marine maintainers, which had been deployed to Iwakuni, in Japan, in support of 31st MEU-SOC. This left us with ten aircraft at MCAS Yuma. Our colonel [Col Savarese] was trying to decide who to put ashore and who to have on the boats. We expected to be one of the two squadrons at sea. However, he decided that the full squadrons at MCAS Yuma [VMA-211 and VMA-311] would give up six aeroplanes, three pilots and 48 troops to me, and that VMA-214 would be the full squadron ashore. We received this news on 8 January 2003, which was just 30 days prior to our deploy date.

'You can imagine the scramble that went into trying to get all the pilots, including the three new guys, mission ready, not to mention the acceptance of six new jets and 48 additional Marines.

'We flew from MCAS Yuma to MCAS Cherry Point in two waves. From there we were supported across the Atlantic by USAF KC-10s, landing in Rota, Spain. We eventually arrived at Ahmed Al Jaber on 16 February 2003.

'Once in-theatre we flew more than 60 OSW missions. They were considered to be combat flights, with all aeroplanes heading into the No-Fly Zone being armed with two AIM-9L/M Sidewinders and laser-guided bombs, as well as a defensive electronic countermeasures [ECM] pod, a full complement of 180 expendables [chaff and flares], two fuel tanks and a Litening targeting pod. As we only had eight Litening II pods, aircraft that lacked a pod were armed with a 1000-lb LGB or two 500-lb LGBs and paired up with a "podded" Harrier II.

'We flew by day and by night. We had a couple of missions receive indications of SAM activity and pilots reported seeing ineffective AAA.'

One of the pilots who flew to Ahmed Al Jaber in a VMA-214 Harrier II was Capt William Maples;

'We were able to take 16 radar-equipped aircraft, which made us the only Harrier II unit committed to the campaign that was equipped entirely with AV-8B+ jets. The squadron deployed with these machines principally because Ahmed Al Jaber lacked positive radar control. When flying among hundreds of other aircraft, as we did on a near-daily basis once in-theatre, it was critical to be able to look at the radar when in air-to-air mode and see what was out there ahead of you – particularly at night or in bad weather.

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Map created by Rock Roszak (*via Author*)

'There was a major fuel pit at Ahmed Al Jaber, so many jets flew in to the base to simply refuel and rearm – we regularly saw AV-8Bs from the ship-based units. Until we got An Numaniyah [60 miles southeast of Baghdad] up and running as a forward arming and refuelling point [FARP] from 8 April, Ahmed Al Jaber remained the forward turnaround site for AV-8Bs in OSW and during the early stages of OIF.'

Capt Maples completed a number of OSW missions in February-March 2003;

'We carried AIM-9Ms on the outboard stations and an AN/ALQ-164 ECM pod on the centreline, plus LGBs. There were a number of mobile SAM threats in the area, and we were not sure where these were on an hour-by-hour basis, so we always carried the ECM pods.

'Most of our OSW missions were performed by a section of two jets, but occasionally we flew as a division of four aircraft – things became more complex with the larger formation. If there were indeed four of us we would split up for the tactical portion of the mission so that we could cover twice the territory, and we usually flew home in a section. At that time we often flew as ISR platforms, since we could record target imagery on 8 mm tapes and debrief in the flightline intel [intelligence] centre back at base. The intel guys would collect the tapes post-mission and use them to help create reports that were sent up the chain of command for use in intelligence planning. We would record the pod imagery, as well as HUD and multipurpose cockpit displays, in order to get a full picture of how a mission played out. At the very end of OSW we got to deploy weapons, but most of our time pre-OIF was spent on ISR.'

VMA-214 had been able to 'hit the ground running' when it came to flying missions into Iraq thanks to the preparations it had made prior to deployment, as Capt Maples explained;

'I was a senior captain, section leader and aviation safety officer for the squadron. One of the things we did just prior to arriving in Iraq was to create the "Black Sheep" playbook, which took all the topics we usually discussed in a typical preflight brief and standardised them so as to cut down on the time it took to cover the administrative aspects of the mission and allow us to focus on tactics and planning. We had both administrative stuff and standard tactics in the playbook, so we could say, "We will use profile Number 1 for a self-lase attack", for example. Everyone knew the playbook well by the time we deployed, thus streamlining the administrative elements of the mission and allowing us to work on tactics in preparation for combat.'

The aerial campaign plan for OIF had been created by a multi-service team over a period of many months. Initially, the plan called for an intense air preparation phase prior to a ground assault, as had been seen in Operation *Desert Storm* some 12 years earlier. However, a heightened

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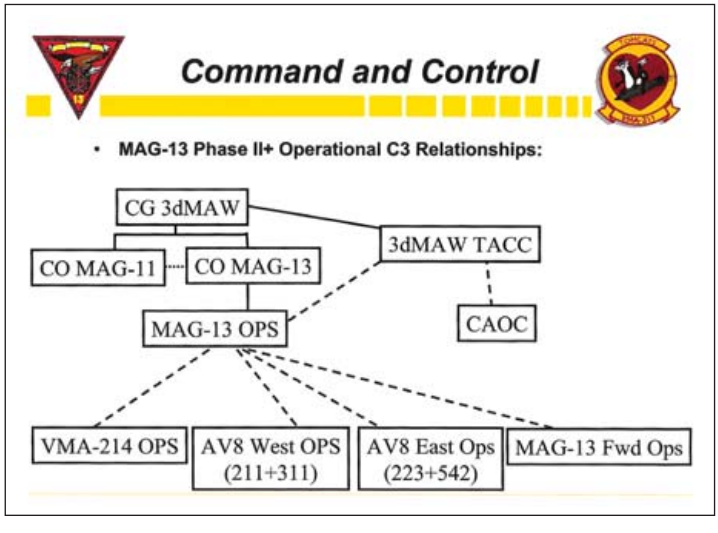
operational tempo during the final weeks of OSW had seen many of the planned targets neutralised before OIF had even started. This duly meant that the air and ground assaults on Iraq commenced almost simultaneously once OIF started. It was hoped that this would prevent Iraqi troops from setting fire to oil wells and destroying other much-needed infrastructure.

The air tasking orders (ATOs) for USAF, US Navy, Marine Corps, RAF and Royal Australian Air Force (RAAF) units assigned to OSW and, subsequently, OIF were developed at the OIF Combined Air Operations Center (CAOC) at Prince Sultan air base, in Saudi Arabia, and distributed to forces spread across thousands of miles from the Mediterranean to Diego Garcia. More than 70 Marines were employed in the CAOC.

USAF Lt Gen T Michael Moseley, Combined Forces Air Component Commander (CFACC), had met with I MEF CO Maj Gen Michael Hagee in late 2002 to thrash out an informal agreement regarding the employment of Marine Corps fixed wing aircraft assets in any future conflict in Iraq. Moseley and Hagee agreed that Hornets, Harrier IIs and Prowlers could be placed on the daily ATO alongside aircraft from the USAF, US Navy, RAF and RAAF, but with the understanding that the primary mission of Marine Aviation was to support I MEF operations. Any excess sorties *after* this support had been fulfilled would be offered to the CFACC for its ATO. The Marine Corps' Direct Air Support Center (DASC) at Ahmed Al Jaber would thus have primary control of air assets over I MEF's area of operations.

The Coalition expected to quickly achieve air superiority over Iraq, allowing ongoing surveillance of the ground situation using satellites, manned aircraft and UAVs. These assets would provide the CAOC with up-to-date reconnaissance imagery of emerging targets and post-strike assessments once they had been attacked.

The Coalition air component deployed in 2003 was smaller to that employed in *Desert Storm*, although in OIF most combat aircraft were equipped with FLIR/laser pods and laser-guided munitions. Some could also deliver new precision JDAM or CBU-105 Sensor Fused Weapons. Air power was to shape the frontline through battlefield air interdiction and close air support (BAI/CAS), which helped to accelerate the advance of ground forces into Iraq.



MAG-13's command and control relationships during OIF I were rather complicated, as this briefing diagram illustrates. AV-8B squadrons VMA-214 (land-based in Kuwait), VMA-211, VMA-223, VMA-311 and VMA-542 (on amphibious assault ships) reported to MAG-13, which was subordinate to the commanding general of 3rd MAW (*Lt Col Mike Hile*)

Marine Corps aviation was given the task of providing support for the assault north by the 1st Marine Division, as well as operations around Basra. On an average day once OIF had commenced, 3rd MAW provided 120 to 150 Harrier II and Hornet strike sorties, while about 100 Cobra attack helicopter sorties were also flown to pave the way for advancing Marine Corps units. These sorties were assigned each day by the Tactical Air Operations Center.

To protect Marine Corps and Army units in the field, a no-bomb line (unless pilots were given directions to perform CAS by a

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FAC) was established ten miles or more ahead of advancing columns. Marine Corps strike aircraft were frequently assigned to patrol kill boxes, where any Iraqi forces located could be attacked.

Harrier II mission assignments in OIF included attacking surface targets, day or night, and other air operations (CAS, armed reconnaissance, air interdiction and helicopter air assault escort) as directed by the DASC. Weapons employed by Marine Corps Harrier IIs included GBU-12 500 lb and GBU-16 1000 lb LGBs, Mk 82 500 lb and Mk 83 1000 lb general purpose bombs, CBU-99/CBU-100 Rockeye cluster bombs and AGM-65E/F Maverick air-to-surface missiles. AIM-9L/M air-to-air missiles were also carried for self-protection, but none were ever employed.

Lt Col Robert Claypool was CO of land-based VMA-214 during OIF I (*Capt C W DelPizzo*)

Typically, one aircraft in a flight of two AV-8Bs carried a Litening II pod, two external fuel tanks and GBU-16s, while the second jet was loaded with two GBU-12s and two external fuel tanks. Early on, when there was a concern about Iraqi fighters interfering with operations, AIM-9L/Ms were carried. For helicopter escort or strikes against area targets, general purpose Mk 82/83 bombs and cluster bombs were carried. Land-based Harrier IIs could also carry additional munitions on the outboard stores stations.

On 20-21 March 2003 (Day One of OIF), Iraqi military targets across the country felt the full weight of Coalition air strikes. 3rd MAW flew 259 missions during the first 24 hours of the campaign, 235 in support of I MEF and 24 assigned by the CFACC. On the ground, British troops approached Basra while US forces moved through the border defences and headed north towards Baghdad in a two-pronged attack – the Marine Corps to the east and the US Army to the west. Within a day, elements of the army's 3rd Infantry Division had penetrated more than 150 miles into Iraq – nearly halfway to Baghdad. British forces had surrounded Basra and the Marine Corps was moving around An Nasiriyah, where it was encountering increased resistance. Worsening weather reduced sorties and made life difficult for both air and ground forces.

Lt Col Claypool observed;

'We were going after tank divisions, Republican Guard divisions and things travelling on the roads. At the start we flew with Sidewinders for the air-to-air threat. There were many Roland and SA-8 mobile SAMs unaccounted for, so we also carried the AN/ALQ-164 jamming pod. All our RHAW [radar homing and warning] gear had to work or we did not launch. Each aircraft had all six buckets of chaff and flares checked before anyone got in the aeroplane. Some jets had 25 mm gun pods fitted too.'

On 23 March Marine Corps units fought a series of intense battles around the city of An Nasiriyah with tenacious Saddam Fedayeen irregular forces that used ambush tactics. Harrier IIs, Hornets, Cobras and USAF A-10s provided CAS for these battles, punishing Iraqi forces.

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Harrier IIs from VMA-513 are parked between blast walls on the brand new hardstanding at Ahmed Al Jaber. Behind them are F/A-18Cs from VMFA-251 and F/A-18Ds from VMFA(AW)-533 (*Maj Doug Glover*)

However, several misdirected air strikes by A-10s hit Marines of Task Force Tarawa, causing casualties. These 'blue on blue' attacks were caused by an error in reporting the location of friendly forces.

The following day more than 1500 sorties were flown in support of the Coalition ground advance, with targets being hit around Baghdad and Mosul. Air and ground operations were adversely affected by storms and blowing sand, however. Yet despite poor weather in central and southern Iraq, the lead elements of the US Army's V Corps reached a point 50 miles south of Baghdad late on 25 March. Coalition air units flew some 1400 sorties that day, including hundreds of strikes against the Republican Guard division holding positions south of Baghdad.

VMA-214 was heavily tasked throughout this period, working particularly closely with the Marine Corps Hornet units as Lt Col Claypool recalled;

'Although we reported to the Harrier Air Group [MAG-13], controlled by Col Savarese, due to our unique geographical location we also had a close working relationship with MAG-11 and its three F/A-18D and two F/A-18C squadrons, co-located with us at Ahmed Al Jaber. We saw plenty of the sea-based Harrier IIs as well, as they would launch from the ships, fly their missions and then use Ahmed Al Jaber as their FOB. Our maintainers would refuel and rearm the aircraft, supporting their second mission of the day, and then they would recover to their boat. Typically, the carriers had an open deck for about ten hours, having taken an hour to get everything ready for flight operations and another hour at the end of the day to close the deck down – this made for a 12-hour day. It was our job to fill in the gaps in that coverage, allowing the *Bonhomme Richard* to work a ten-hour day.'

Weather was still posing a challenge on 27 March, resulting in many sorties being scrubbed. Towards the end of the day conditions improved, and air and ground operations in Iraq intensified. On the 28th US forces converged on Baghdad, with the US Army's V Corps approaching from the southwest and the Marine Corps from the southeast. The 3rd Infantry Division and the 1st Marine Division slowed their advance on 28-30 March for re-supply and rest.

Harrier II pilots had seen plenty of AAA and sporadic SAM launches throughout this period, although the latter were becoming increasingly rare by 30 March as Lt Col Claypool recalled;

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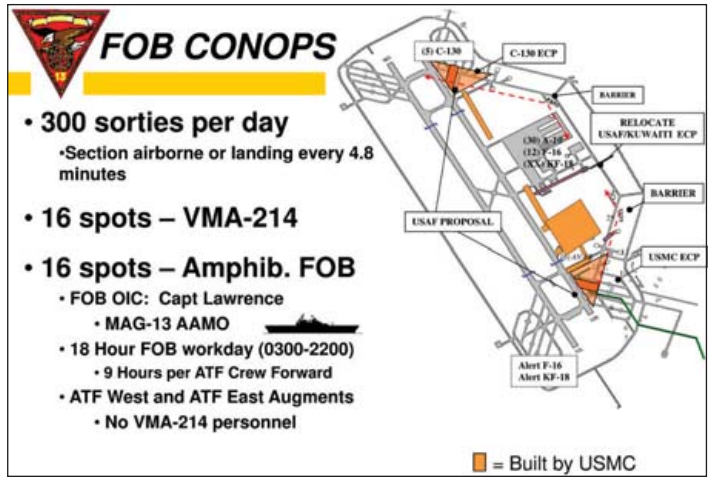
'Our guess was that the Iraqis were choosing not to expose themselves since we could follow the missile's smoke trail back to the launch site and drop a bomb on it. The rest of the stuff, like smaller shoulder-launched SAMs, could not make it to our altitudes and fell well short of us. Thus, after the first week of the war, we dropped the Sidewinders and DECM pod. I told my guys not to go below 10,000 ft unless there was a very good reason to do so, and I decided to download all gun pods since we could not really use them effectively from those altitudes.'

On 30 March 3rd MAW flew 300 sorties against Iraqi targets, with the bulk of these focused on pounding mechanised units and artillery surrounding Baghdad. The goal was to cause attrition and hold these forces in place so that they could be surrounded. That same day the Royal Marines initiated Operation *James*, which ultimately resulted in the capture of Basra.

Having been in-theatre for almost six weeks by the end of March, VMA-214 had become very familiar with the operational capabilities of the other strike aircraft types that it shared ramp space with at Ahmed Al Jaber. One such machine was the A-10A Thunderbolt II, examples of which were flown by no fewer than five squadrons assigned to the 332nd Air Expeditionary Group at the base. Capt Maples was struck by the weapons-carrying capacity of the jet;

'The A-10 had an impressive load-out of bombs, IR Mavericks and its super 30 mm gun. It flew the same kinds of FAC missions as we did, but had a much longer loiter time. The A-10 also flew at a considerably slower speed than the Harrier II, so it took longer for the jet to fly to the same spot to perform a similar mission. The A-10 was also limited in its effectiveness by its sensors. Indeed, a number of the guys I talked with on base who flew the jet told me that they relied on binoculars in the cockpit to spot their targets. The ROE prohibited us from flying below 10,000 ft, which made their job very difficult with the sensors they had unless they were talking to a FAC on the ground. On numerous occasions the A-10 guys relied on target coordinates that we gave them after we had exhausted all of our bombs and were running low on fuel at the end of an armed reconnaissance mission. They might have had the fuel and the ordnance, but we had the Litening II pod.'

However, VMA-214 was not the only unit at Ahmed Al Jaber equipped with the Litening II pod. The 524th FS had deployed to Kuwait from Cannon AFB, New Mexico, with 12 F-16CGs in December 2002 (six more arrived later once hostilities appeared to be inevitable), all of its Block 40 aircraft being fitted with Litening II pods. This meant that the F-16s could drop both LGBs and JDAM. The 524th was manned by a lot of high-time pilots with extensive targeting pod experience, and VMA-214 learned a lot from the unit prior to OIF commencing.



This detailed diagram shows the layout of the critically important Forward Operating Base at Ahmed Al Jaber, which was used extensively by ship-based Harrier II units for refuelling and rearming throughout OIF I. The orange dispersal areas for visiting aircraft were hastily constructed by Marine Corps engineers in the weeks leading up to OIF I (*Lt Col Mike Hile*)

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The pilot of an AV-8B+ from VMA-214 at Al Jaber taxies out at the start of an OIF mission in April 2003. Note the name of legendary World War 2 ace and unit founder Maj Gregory 'Pappy' Boyington beneath the cockpit of the aircraft. VMA-214 has long had a tradition of adorning its jets with Boyington's name (*Maj Doug Glover*)

'3rd MAW had its Tactical Air Command Center [TACC] located right next to our operations building', explained Capt Maples, 'so we frequently went there and talked tactics with the MAWTS [Marine Aviation Weapons and Tactics Squadron] instructors that augmented 3rd MAW during OIF. We also had a number of Harrier II IPs [Instructor Pilots] who flew with us as augment aircrew, and they worked in the TACC when on the ground. So we had a unique perspective of the fight. I flew a number of missions with MAWTS IPs, and their experience certainly allowed me to improve my warfighting ability in the Harrier II'.

By late March the mission tasking for VMA-214 was beginning to change, as Capt Maples recalled;

'Early on in the war we flew a lot of CAS, which required close coordination with the FAC, and we employed a lot of LGBs. As the conflict wore on and our guys moved further north, we carried out more armed reconnaissance in an attempt to find out what was occurring on the battlefield. The ordnance load-out on our aircraft was based on the known or anticipated target sets we expected to have to deal with once over the frontlines.

'With the air-to-air and air-to-ground threat suppressed or neutralised by late March, Lt Col Claypool determined, after talking with his weapons and tactics leads, that we no longer needed to carry AIM-9s for the air threat or AN/ALQ-164 pods for the SAM/AAA threats. We took them off the jets and never put them back on. The AN/ALQ-164 pod was only carried on the centreline station, which remained unused otherwise. The EW pod caused more drag, thus increasing our fuel burn and reducing our time on station. It also restricted the manoeuvrability of the jet.'

More than 1000 sorties were flown on 1 April, with interdiction strikes on Iraqi Republican Guard divisions deployed in a defensive ring south of Baghdad again being the primary focus of air strikes. The three Republican Guard divisions in position around the capital included the Medina Armoured Division south of the city, the Al Nida Armoured Division to the east and the Baghdad Motorised Division near the city of Al Kut.

On 1 April VMA-214 was assigned the role of supporting the rescue of US Army PFC Jessica Lynch, who had been seriously injured and captured when her supply convoy was ambushed during the battle for Nasiriyah seven days earlier. Capt Jeffrey Scott, who participated in this mission, recalled;

'I was assigned to fly a night armed reconnaissance mission, and we were planning when we got the word that the TACC had changed our mission. We had been reassigned to PoW [Prisoner of War] rescue. We got all the details from the TACC about frequencies, call signs, altitudes and other units that were participating in the rescue attempt.

'We had two sections committed to the operation. The first section went out to strike the Ba'ath Party building in Nasiriyah as a diversion for the nighttime raid by Joint Special Operations Task Force 121, US Army Special Forces, Air Force Pararescue Jumpers, Army Rangers and

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1st SFOD-D (Delta Force) on Saddam Hospital, where the PoWs were being held. The second section would come and relieve the first pair of jets, allowing them to go to the tanker then come back on station. My wingman and I made up the second section, and we were to go in and cover the critical PoW extraction phase of the operation.

A VMA-214 Harrier II is refuelled by personnel from Marine Wing Support Squadron 271 at a Forward Arming and Refuelling Point (FARP) within Iraq on 3 April 2003. The AV-8B+ is being refuelled 'hot', with its engines running. This was just one of many FARPs set up south of Baghdad during the final stages of OIF I. Some made use of recently captured airfields, while others were situated on long stretches of highway (*US Marine Corps*)

'Our game plan was to keep eyes on the hospital with our Litening II targeting pods – we had the very latest version, which had a video data link. Using the Pioneer data link via Pioneer antennas erected by Task Force Tarawa on the ground, our FAC was able to receive a video downlink of the pod-generated imagery that we were looking at in the cockpit. This in turn proved to be greatly beneficial to their situational awareness of how the extraction was progressing. We got down as low as we safely could given the SAM and AAA threat in the area. Although we couldn't get as low as we would have liked, we could still be clearly heard by the residents of Nasiriyah.

'We set up a search pattern, and our sensor imagery was sent via the data link to the FAC with Task Force Tarawa. The Litening II pod revealed that the distraction of the diversionary attack in the southern area of Nasiriyah, away from the hospital, had worked, keeping everyone indoors.

'The helicopter tasked with the extraction showed up on time, the CH-53 parking on a lawned area in the middle of the city. That was a pretty brave move. We kept a close watch out for any enemy activity throughout the helicopter's time on the ground. Our plan was that if anyone caused problems, we would target them with three LGBs and cluster bombs. Our secondary plan was to mark targets for an AC-130 Specter that was on station, and let him unleash his weapons systems on the target. Things went off without a hitch, and we got the PoW out. We were told to watch CNN. It was great to see they had rescued Jessica Lynch, but sad to hear that they had also found a lot of dead bodies.

'Despite not dropping any ordnance, this was a very rewarding mission for us. The Litening II pods on our jets had been hugely important throughout the operation.'

As the Marine Corps advanced on Baghdad, Harrier II units began flying from a forward site just 90 miles south of the Iraqi capital. Lt Col Claypool recalled the background behind operations from deep inside Iraq;

'Maj Gen Amos was very determined that the Harrier II should remain in the fight when the campaign moved further north. VMA-214 was billeted right next door to him at Ahmed Al Jaber, and he would walk into our ready room and watch videotapes and drink coffee with us. One day he walked in and I was in the middle of a brief. I usually led the first section out in the morning. Maj Gen Amos remarked, "I want you guys to land on a road south of Baghdad. Can you do it?" My wingman had not seen the road and remarked that there were risks involved. When Maj Gen Amos replied "The risk is on me", we said, "Yeah, we will go to the road!" So we went there, and I landed first. Having then taken off again, I got Litening II pod footage of my wingman landing. We later

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put four Harrier IIs on the road and filled them with gas. A short while later Coalition troops seized an airfield at An Numaniyah, which helicopters initially used as a FARP, then C-130s and, finally, Harrier IIs from 8 April – we refuelled and rearmed here.'

On 2 April the 1st Marine Division engaged elements of the Iraqi Baghdad Division as it continued its push north on Highway 7 and toward the Tigris River on Highway 27. Elsewhere, US Army units seized ground around the city of Karbala and erected a makeshift bridge across the Euphrates River and headed for Baghdad.

Heavy fighting continued, and on 3 April elements of the 3rd Infantry Division engaged Iraqi forces defending Baghdad International Airport. That same day the 1st Marine Division engaged entrenched Republican Guard units southeast of the capital, while British forces continued their advance on Basra. Heavy air support was provided for these attacks, and interdiction strikes continued around Baghdad, Basra and in northern Iraq.

Baghdad Fedayeen launched a counter attack against US forces at the airport on 4 April, suffering heavy losses in the process. The 1st Marine Division, meanwhile, fought with elements of the Al Nida Division as it pushed up Highway 6 southeast of Baghdad.

The following morning the 3rd Infantry Division of the 2nd Brigade conducted a surprise assault on Baghdad that was dubbed the 'Thunder Run', dozens of M1A1 Abrams main battle tanks and M2 Bradley infantry fighting vehicles racing through the southern suburbs towards the city centre in order to test the strength of remaining Iraqi defences. Moving at a fast pace, the force appeared to have caught enemy troops completely off guard. Eventually taking heavy fire from small arms and rocket-propelled grenades, the tanks inflicted serious damage and caused panic among the defenders. That same day the 1st Marine Division fought to within 12 miles of the centre of Baghdad, relying heavily on continuous CAS.

On 6 April, British forces completed their assault on Basra, the situation in the city having quickly deteriorated once government officials had fled. Further north, US Army and Marine Corps units linked up southeast of Baghdad as the Iraqi Army retreated into the city following constant attacks by aircraft, artillery and tanks.

The 3rd Infantry Division made another 'Thunder Run' with armoured vehicles into Baghdad on 7 April, and this time the troops involved remained in control of several intersections and one of Saddam Hussein's palaces. Baghdad International Airport was cleared, the runways opened and C-17s and C-130s started flying in troops and supplies. US Marines crossed Diyala Bridge under fire and pressed on into Baghdad.

American forces poured into Baghdad and there was heavy fighting with Fedayeen and militia units in urban areas the following day. Coalition aircraft pressed home their attacks on targets in and around Baghdad, resulting in one A-10 being shot down and another seriously damaged.

On 9 April, US Marines pulled down the statue of Saddam Hussein in Firdos Square, and this image, covered live on television and later in newspapers worldwide, came to define the defeat of the Ba'athist regime in Iraq. Sporadic fighting continued in several areas of Baghdad until well into 10 April as the US Army and Marine Corps overran the final pockets of resistance. Numerous Coalition air strikes were conducted throughout the day.

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Armed with a single AGM-65E Laser Maverick missile under each wing, this Ahmed Al Jaber-based Harrier II+ from VMA-214 will soon be on its way north to attack targets in downtown Baghdad on 10 April 2003. The 'LMAV' became the preferred CAS weapon for the Harrier II during the assault on the Iraqi capital, as troops could designate the exact spot that needed to be struck – critically important when fighting in urban settings, where collateral damage has to be avoided at all cost (*Capt C W DelPizzo*)

Amongst the pilots to see action on the 10th were VMA-214's Maj Mark Butler and his wingman Capt Tyler Bardo. The details of their mission over Saddam's Azimiyah Palace, on the banks of the Tigris River in central Baghdad, and the nearby Imam Abu Hanifah Mosque were described by former Hornet pilot Jay Stout in his OIF volume *Hammer from Above – Marine Air Combat Over Iraq*;

'Maj Mark "Butts" Butler and his wingman, Capt Tyler "Hefty" Bardo, "Mover 01" flight, had just finished a high-cover escort for a group of helicopters flying low overhead Baghdad when they were directed to contact Capt Aaron "Sulu" Locher, the FAC assigned to Charlie Company of the First Battalion. An aviator who had previously flown UH-1N Hueys, OIF was Locher's second tour of combat – he'd already seen more fighting than he'd wanted in the tribal hellhole that was Afghanistan. Locher, who had been awake since the day before, was still running the air fight at the palace. "The FAC came up on the radio", Butler remembered, "and said that they were trying to hit a tower – they had been taking RPG and machine gun fire from it all day".

'The tower that Locher wanted hit was actually one of minarets that made up a corner of the Abu Hanifah Mosque. There, Iraqi fighters tenaciously carried on their fight. Locher was excited when the two Harriers checked in, but knew that both he and they would have to be quick and good to accomplish what needed doing. "Between them both they had just one LGB and two Maverick missiles. And not much fuel".

'The Iraqis in and around the mosque had been sniping at the Marines almost since the beginning of the fight, and Locher wanted them dead. "All day we had been taking fire from the tower. I wanted the Harriers to level that thing". He passed the tower's coordinates to Butler, along with a short brief. His expeditious control of the two ships was savvy, and reflected his experience as a Marine aviator on his second combat tour as a FAC.

'"After I passed the grid coordinates of the mosque tower to the lead Harrier", Locher recalled, "I asked him to tell me what he could see through his FLIR".

'"A tall round building", Butler replied.

'Butler had the correct target, but it still took several more exchanges over the radio to convince him of this. "I was looking at the biggest tower I could see", he explained, "but I still thought that I had the wrong one because it was the minaret of the mosque". His confusion was understandable.

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Lt Col Robert Claypool (rear) and Capt William Maples try to catch up with their sleep during the closing stages of OIF I. Harrier II pilots from the unit flew more than 1900 sorties and delivered 236,000 lbs of ordnance between 19 February and 1 May 2003. Initially, VMA-214 flew 30-32 sorties a day, but as the conflict wore on it was reduced to 20-24 sorties a day (*Capt C W DelPizzo*)

Religious centres and other cultural features were lawful to strike only on very rare occasions. This was one of them. The minaret was being used by enemy combatants to launch attacks, and so now met the criteria that made it a valid target.

'"Do you have time for a practice run?" Locher asked, as he was concerned because there were so many friendly troops in close proximity. "We've got to get this right".

'Butler was willing. With Bardo on his wing he swung around and set up for an attack on the tower.

'"It was flawless", remembered Locher. "I told him to set back up for real this time – and that I wanted him to give me a thirty- and ten-second time-to-impact call over the radio".

'Butler set up for his run. Bardo was still in formation. Locher checked that the jets were pointed away from friendly troops and toward the target.

'"Wings level", the Harrier pilot transmitted, indicating that he was in his dive, had the target in sight and was prepared to drop his bomb.

'"You're cleared hot", Locher replied.

'"One away". Butler let the bomb fall. "Thirty seconds". The Harrier started a climb back to altitude and a turn away from the target.

'"Ten seconds . . ."

'There was a puff of dust on the ground below the tall structure. Nothing more.

'"That bomb hit exactly at the base of the tower", Locher recounted. "Unfortunately it was a dud". This was a common problem throughout OIF.

'All of their work had been for naught. Still, the FAC wasted no time. "I had them set up for another run with their Maverick, and told them to aim for the bottom of the top third of the tower".

'"We reset so that 'Hefty' could shoot one of the Laser Mavericks he was carrying", Butler recounted. "I was starting to get nervous – we were attracting some AAA now, and getting low on fuel as well". The two Harriers dived on the tower as Locher and his team watched from the roof of the palace. Inside his aircraft Butler slewed the crosshairs of his Litening pod over the minaret. When the display indicated that the two Harriers were in range, he fired the laser and called over the radio to Bardo, "Target captured, laser's on".

'In the cockpit of his aircraft Bardo watched his Maverick display for the indications that the weapon was locked on to the tower that Butler was marking with his laser. He heard Butler call "Wings level" over the radio, and Locher's response, "Cleared hot". Still, there was no indication that the Maverick was ready to launch.

'Butler flew the section of Harriers at the mosque until they were too close and had to abort the run. He pulled his aircraft out of the dive and called out to Locher, "'Mover 01's aborting". Bardo followed him out of

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Pilots from VMA-214 pose in front of, and on, the CO's Harrier II at Ahmed Al Jaber on 18 April 2003 (*Lt Col Robert Claypool*)

the dive. "It was make-or-break time", Butler said. "We had time for one more quick pass if everything went perfectly". He knew he was taking a risk. "Flying at the same target, from the same direction, four times in a row was just asking for trouble", he remembered. "I could just see the Weapons and Tactics Instructors [WTIs] back home raising their eyebrows". Regardless, the instructors back home weren't being counted on at this moment in time to help their comrades under fire.

'Butler brought the two jets around for one more attack. Again, he captured the tower in his FLIR display and fired the laser. At the same time he called out "Wings level". Locher replied just as he had three times earlier. "Cleared hot". Bardo's missile finally locked on to the laser energy that Butler was bouncing off the mosque. He squeezed the trigger on the control stick and simultaneously made the call "Rifle". The Maverick rocketed away from where it had been hung underneath his aircraft's left wing.

'Butler remembered, "I kept thinking to myself, 'Don't fuck this up, centre the pipper, keep it slewed on the target'. He did. The missile struck the minaret a third of the way from the top. Chunks of masonry rained down on the street.

'"I never saw anything so pretty as when that missile came off and smashed exactly on target", Locher said. "The entire top of that tower turned into rubble. We didn't get shot at from there anymore".

'Above him, Butler arced the two Harriers into a climbing turn to the southeast. They were out of fuel and headed back for the base.'

The battle for Azimiyah Palace and Imam Abu Hanifah Mosque fought itself out by the next morning. Estimates of Iraqi and Fedayeen dead ran into several hundreds. The Marines of First Battalion Fifth Marines sustained heavy casualties as well, with the Purple Heart (awarded for injuries sustained in combat) being presented to 98 men. Miraculously, only one Marine was killed.

A section of concrete blast pen wall served as VMA-214's scoreboard in OSW/OIF I. The 500-lb GBU-12 LGB was the unit's weapon of choice during the conflict (*Lt Col Robert Claypool*)

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Kirkuk, a town in the north, fell to Kurdish fighters assisted by Special Forces that same day (11 April), and Mosul was occupied by Coalition troops too. Marine Task Force Tripoli, with heavy air support, rushed 90 miles north to Saddam Hussein's hometown of Tikrit – three days later it fell to US troops. By 15 April OIF I was over, with most of Iraq under Coalition control.

Offensive operations had commenced on 19 March 2003 with 'Shock and Awe' strikes on Iraqi leadership targets in Baghdad, and after 27 days of combat Coalition forces were in general control of the major cities of Baghdad, Basra, Mosul, Kirkuk and Tikrit. On 1 May, President Bush declared an end to major combat activities in Iraq.

Throughout the campaign FACs in tanks, armoured vehicles or aircraft such as the F/A-18D or OA-10 had often assisted in kill box strike efforts, and were always involved in coordinating strike aircraft and attack helicopter CAS for advancing units. The demand for CAS increased in the later stages of the campaign as the US Army and Marine Corps approached Baghdad.

Intense air strikes were directed against the Iraqi divisions opposing I MEF's advance, resulting in literally hundreds of enemy vehicles and other targets being destroyed. Frequently, Iraqi forces abandoned tanks, armoured personnel carriers (APCs), artillery and vehicles when they came under air attack. As a result, the combat effectiveness of Iraqi units was adversely affected even if its equipment was not damaged in any way. Harrier IIs fitted with Litening II pods were also routinely given the task of attacking point targets such as vehicles in kill boxes, command centres and bridges, since pilots flying these aircraft could effectively detect tactical targets from medium altitudes thanks to the pod.

From 19 February until 1 May 2003, the 'Black Sheep' of VMA-214 flew more than 1900 sorties, delivered 236,000 lbs of ordnance and suffered zero losses. Lt Col Claypool reviewed some of the squadron highlights from its time in Kuwait;

'The only surprises I had when looking back just after the fighting had ended was how tired we were by mid-April and how maintenance was able to sustain such a high ops tempo. As you know, we were sleeping in tents. They were not insulated or air-conditioned, and they were out next to the runway – and we operated 24 hours a day. The combination of jet noise from a takeoff or landing every 15 minutes and ongoing intense operations created long-term fatigue. At first we flew 30-32 sorties a day, and later, as the conflict wore on, we backed off to 20-24 sorties a day. My great maintenance team was able to keep this going, even though we had to work hard to get spare parts to Ahmed Al Jaber. The pace of intense operations and reduced sleep wore us down after time.

'I'm really proud of what the Marines did here. I MEF fought in all directions and got to Baghdad, and my boys got to fly in support of all that – we did recce, we did bombing. It was really a privilege to see it, and be a part of it.'

The MAG-13 Harrier IIs of VMA-513 shared ramp space at Ahmed Al Jaber with USAF TACAIR types from the 332nd Air Expeditionary Group, the RAF's Nos 1(F) and IV(AC) Sqns (the latter both equipped with Harrier GR 7s) and Hornets of MAG-11. This formation photograph, taken on 30 April 2003, is led by an A-10A of the Michigan Air National Guard's 172nd FS. To the A-10's right is an F/A-18C from VMFA-251 and a No 1(F) Sqn Harrier GR 7, whilst to its left is one of 18 524th FS F-16CGs that called Ahmed Al Jaber home, and an AV-8B+ from VMA-214. Behind the formation can be seen the MAG-11/13 TACAIR ramp. Note that all of the aircraft are carrying live ordnance (*Capt Ed Bahret*)

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1
AV-8B BuNo 163675 of VMA-311 Detachment A, 15th MEU-SOC/HMM-268, USS *Peleliu* (LHA-5) and Ali-Al-Salem, January 1996

2
AV-8B Bu No 164145 of VMA-211 Detachment A, 11th MEU-SOC/HMM-166, USS *Essex* (LHD-2) and Ahmed Al Jaber, January 1997

3
AV-8B BuNo 164121 of VMA-513 Detachment A, 15th MEU-SOC/HMM-163, USS *Essex* (LHD-2) and Ali-Al-Salem, October 1998

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4
AV-8B BuNo 163870 of VMA-214 Detachment A, 13th MEU-SOC/HMM-364, USS *Boxer* (LHD-4), North Arabian Gulf, March-April 1999

5
AV-8B BuNo 165391 of VMA-231 'Det A', 24th MEU-SOC/HMM-263 and I MEF/ATF-E, USS *Nassau* (LHA-4), Northern Arabian Gulf, March 2003

6
AV-8B BuNo 165580 of VMA-214, Ahmed Al Jaber, April 2003

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7
AV-8B BuNo 164119 of VMA-211, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6), Northern Arabian Gulf, March 2003

8
AV-8B BuNo 165004 of VMA-542, I MEF/ATF-E, USS *Bataan* (LHD-5), North Arabian Gulf, April 2003

9
AV-8B BuNo 165583 of VMA-311, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6), Northern Arabian Gulf, April 2003

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10
AV-8B BuNo 164566 of VMA-311 Detachment A, 15th MEU-SOC/HMM-161 and I MEF/ATF-W, USS *Tarawa* (LHA-1), Northern Arabian Gulf, April 2003

11
AV-8B BuNo 165429 of VMA-214, Al Asad, June 2004

12
AV-8B BuNo 164556 of VMA-542, Al Asad, July 2004

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13
AV-8B BuNo 165595 of VMA-211 Detachment A, 31st MEU-SOC/HMM-265, USS *Essex* (LHD-2) and Al Asad, September 2004 to February 2005

14
AV-8B BuNo 165397 of VMA-311, Al Asad, February 2005

15
AV-8B BuNo 164562 of VMA-223, Al Asad, October 2005

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16
AV-8B BuNo 165006 of VMA-211 Detachment A, 31st MEU-SOC/HMM-265, USS *Essex* (LHD-2) and Al Asad, September 2005 to February 2006

17
AV-8B BuNo 165568 of VMA-513, Al Asad, April 2006

18
AV-8B BuNo 165578 of VMA-211, Al Asad, December 2006

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19
AV-8B BuNo 165595 of VMA-311 Detachment A, 15th MEU-SOC/HMM-165, USS *Boxer* (LHD-4) and Al Asad, November 2006 to April 2007

20
AV-8B BuNo 164570, VMA-231, Al Asad, April 2007

21
AV-8B BuNo 165587 of VMA-513 Detachment A, 13th MEU-SOC/HMM-163, USS *Bonhomme Richard* (LHD-6) and Al Asad, June to September 2007

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22
AV-8B BuNo 164567 of VMA-542, Al Asad, November 2007

23
AV-8B BuNo 165570 of VMA-311, Al Asad, March 2008

24
AV-8B BuNo 163870 of VMA-311 Detachment A, 15th MEU-SOC/HMM-165, USS *Peleliu* (LHA-5), Northern Arabian Gulf, June-July 2008

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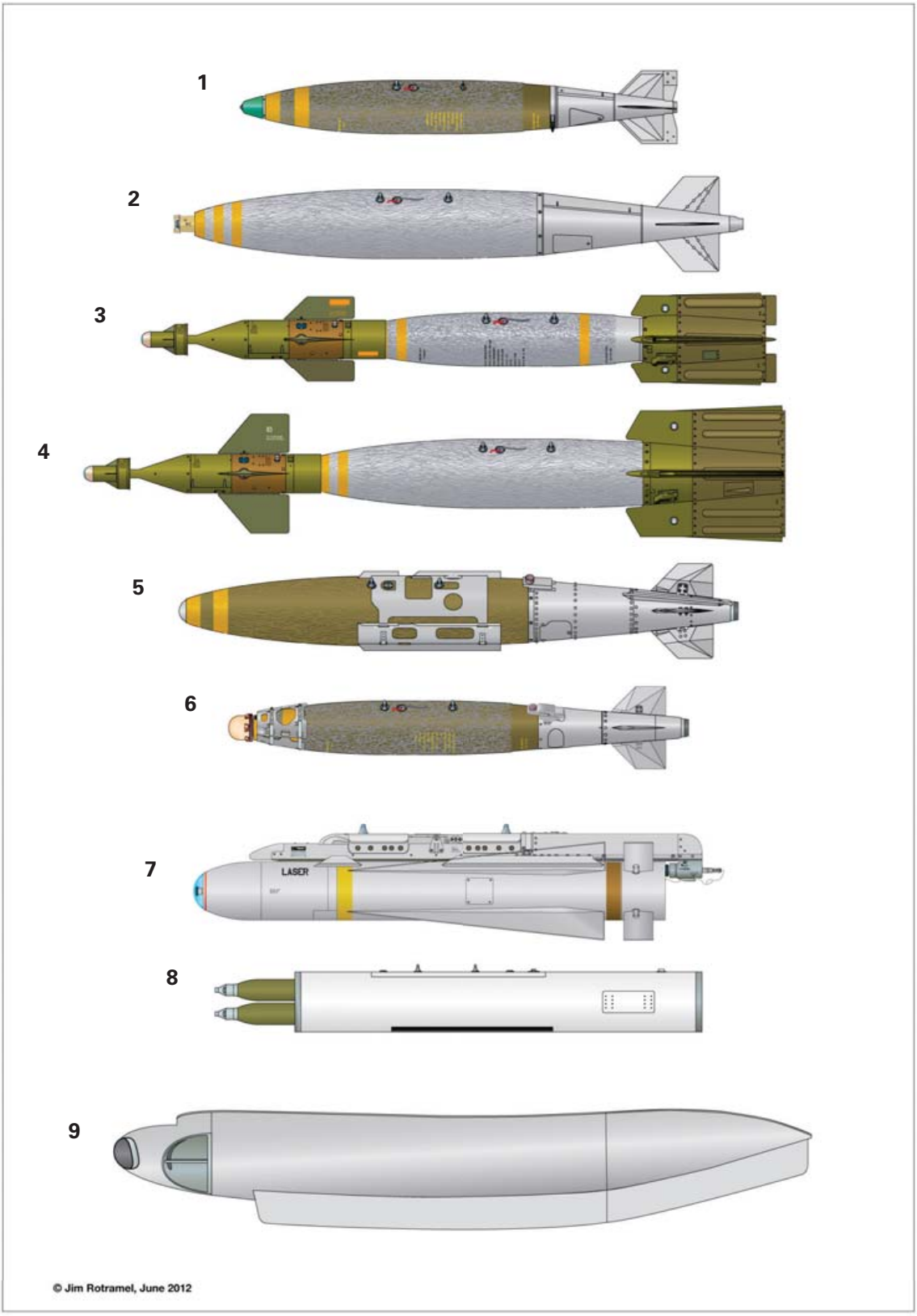

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AV-8B OSW/OIF ORDNANCE

1

The Mk 82 Mod 2 bomb is identifiable by the two yellow bands indicating it is filled with H-6 explosive as opposed to the Tritonal fill used by the USAF's Mod 1 bomb, with its single yellow band. Many Mod 2s were repainted from the late 1980s in Light Ghost Grey, making them look similar to the grey BLU-111, which has three yellow bands identifying its PBXN-109 explosive fill. This particular Mk 82 features the BSU-33 conical fin and a Mk 43 target-detecting device, which was retired from frontline service in October 2004.

2

The 1000-lb BLU-110 is the largest warhead employed by the AV-8B. Physically identical to the earlier Mk 83, it differs by being filled with PBXN-109 explosive, as indicated by the three yellow bands on the nose. This bomb features a conical fin and a TP M904E4 mechanical nose fuse. The latter was retired in 2011.

3

The GBU-51 LGB can be distinguished from the GBU-12 by the yellow band aft of the warhead suspension lugs. This identifies the 500-lb warhead as a BLU-126/B thermally protected Low Collateral Damage Bomb, which differs from the BLU-111 warhead by having only 27 lbs of PBXN-109, instead of the normal 236 lbs. For guidance, both the GBU-12 and GBU-51 can be fitted with Raytheon MAU-169 or WCU-10 or Lockheed Martin MAU-209 kits and an MXU-650 aerofoil group. The GBU-51 became available for combat use in March 2007.

4

This 1000-lb GBU-16 LGB is built around the BLU-110 thermally protected warhead, as can be seen by the two two-inch wide yellow bands, the first of which is obscured by the guidance section's adapter collar. Like the GBU-51, for guidance it can be fitted with Raytheon MAU-169 or WCU-10 or Lockheed Martin MAU-209 kits, combined with a MXU-667 aerofoil group. The latter includes not only the tail assembly but the fins that are attached to the guidance section and the adapter collar.

5

This GBU-32(V)2/B JDAM is composed of a Mk 83 Mod 5 thermally protected 1000-lb warhead, KMU-559 guidance kit and a MXU-735 nose plug. The weapon's first operational deployment with the Harrier II came in March 2006, when VMA-513 replaced VMA-223 at Al Asad. In most cases, the warheads used with the bombs on this page are interchangeable (i.e., Mk 83 and BLU-110, or Mk 82 and BLU-111) without altering the designation of the bomb, the GBU-51 with its BLU-126 being the exception.

6

This GBU-38(V)2/B JDAM is composed of a Mk 82 Mod 2 thermally protected 500-lb warhead, KMU-572 guidance kit and a DSU-33 radar proximity sensor, which began replacing the Mk 43 target-detecting device from about 2000. The GBU-38's first AV-8B deployment was also with VMA-513 from March 2006, with the first example being expended in combat on 11 May.

7

AGM-65E Laser Maverick mounted to a LAU-117A(V)2/A launch rail. The 'LMAV' became the preferred CAS weapon for the Harrier II in OIF, especially in urban settings, because troops could designate the exact spot that needed to be struck. Originally a Marine Corps-only weapon, the US Navy quickly adopted the 'LMAV', and some were even loaned to the USAF until it began receiving its own AGM-65E-2s in 2011.

8

The 150-lb class LAU-10D/A is a thermally protected rocket launcher that carries four 100-lb class 5-in diameter Zuni rockets that mount a variety of warhead and fusing combinations. This particular launcher is carrying Mk 352 fused Mk 34 Smoke warheads mounted on Mk 71 Mod 1 wraparound fin aircraft rockets (WAFAR). Unlike 2.75-in rockets, the Zunis enjoy a reputation for being extremely accurate.

9

The General Electric GAU-12U Equalizer is a 25 mm five-barrel Gatling gun that uses a linkless feed system from a 300-round magazine in the Harrier II's GFK-11/A49E right fuselage pod to the 275-lb gun in the GAK-14/A49E-10 left pod (shown here). The feed system is powered by engine bleed air. The Equalizer can fire up to 4200 rounds per minute, but is normally restricted to 3600 rounds per minute, with a muzzle velocity of 3600 ft per second.

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OIF I – VMA-311 AND VMA-211

Some 60 AV-8Bs – more than 45 per cent of 3rd MAW's fixed-wing offensive air support for OIF – flew from amphibious assault ships sailing in the NAG. This Marine Corps STOVL strike force was a much appreciated capability since airfields in-theatre were limited due to both geographical and political reasons, and those that were available were filled to over-capacity.

Bonhomme Richard embarked jets from VMA-211 and VMA-311, while *Tarawa* was home to a six-aeroplane detachment from the latter unit. With the LHD's arrival in-theatre, more than 1000 Marines from the 3rd Battalion, 1st Marine Division, disembarked, allowing the ship to prepare for round-the-clock AV-8B operations. When asked about this mission change, *Bonhomme Richard's* CO, Capt Jon F Berg-Johnsen, noted at the time, 'The amphibious Navy/Marine team is more flexible than ever. We can tailor our support to respond to different mission requirements'. This view was echoed by MAG-13 CO, Col Mark Savarese;

'The ship's company plays an enormous role in the "ballet" that is launching aircraft. Everyone on this ship has ownership of the aeroplane, from the seamen to the private first class to the captain of the ship to myself – it takes everyone. The beauty of the Harrier II is its flexibility. A unique aeroplane, it can go anywhere and operate from anywhere, which is what allowed us to operate from what I liked to call an attack carrier.'

Aircraft, crews and support personnel were split among the amphibious assault ships to create Amphibious Task Forces East and West for 24-hour sustained operations. *Bonhomme Richard* served as the home for 22 jets from VMA-211 and VMA-311, along with the staff of MAG-13. These Harrier IIs, and the six-aircraft detachment from VMA-311 aboard *Tarawa*, formed Amphibious Task Force West. VMA-542 and VMA-223, embarked in *Bataan*, along with a six-aircraft detachment from VMA-231, flying off *Nassau*, formed Amphibious Task Force East.

Lt Col Kevin S Vest was CO of VMA-211 during its OIF deployment, and he recalled;

'Our troops boarded the ship in San Diego on 15 January 2003, and we flew out to *Bonhomme Richard* two days later. I then met with my opposite number in VMA-311, Lt Col Mike Hile, as well as Col Mark Savarese and the MAG-13 staff, to discuss how to really make the ship a "Harrier carrier" during the trip from San Diego to the NAG.

'Typically, L-class amphibious assault ships and their crews are used to carrying a composite squadron of 30 aircraft – 24 helicopters and six Harriers. This particular vessel had never previously operated as an exclusively fixed-wing aircraft carrier. The ship was not really designed to embark two Harrier II

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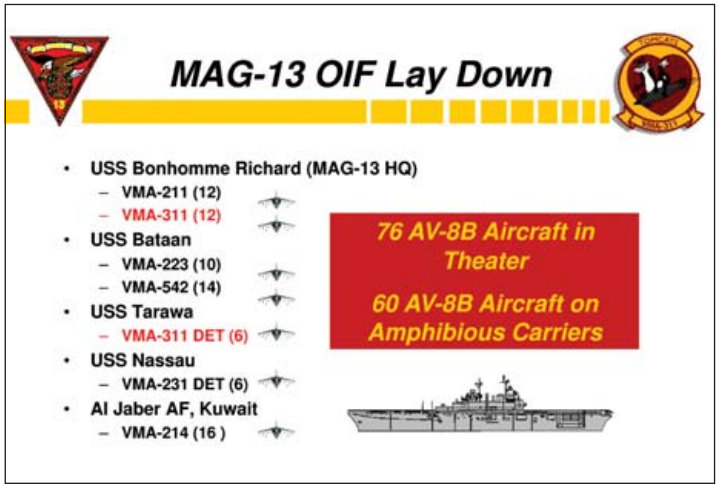
A mix of AV-8B Night Attack and AV-8B Harrier II+ aircraft from VMA-311 and VMA-211 sit alongside a CH-53E on the bow of LHD-6 as the carrier heads for the NAG on the eve of OIF I. The 24 Harrier IIs embarked in *Bonhomme Richard* flew more than 850 sorties during the conflict (*Col Brad Gering*)

squadrons in it. We used our transit time to the NAG to iron the bugs out on how the two squadrons and the ship's company would work together on take offs and landings and the loading of ordnance.

'The first step to achieving this goal was to get the jets aboard the ship and start flying, allowing everybody to get back into the operational groove for both day and night flights. Adopting a "crawl, walk, run" approach to the task at hand, we got everyone to fly carrier qualification patterns, day and night, while the vessel was still in the San Diego area so that we had a divert option ashore if required.

'We also had to get used to having two Harrier II squadrons embarked in a vessel that was really designed to have only one aboard. Lt Col Hile and I looked at the strengths and weaknesses of each unit and then worked out how to combine the two in order to make Harrier II operations from *Bonhomme Richard* as effective as they could be. For example, I had a stronger ordnance department as Lt Col Hile's was weak in experience, so we combined them and my folks ended up running it. However, when it came to providing serviceable flight equipment [helmets, g-suits, masks etc.] I had only three maintainers and VMA-311 had eight, so Lt Col Hile's unit controlled that area. In maintenance, we kept our individual squadron identities but worked together towards achieving the common goal of keeping the aircraft up and operating. We also had to do the same things in Operations, Intel, Supply – in almost every other area.

'We brought the units together so that they were working with each other, rather than competing with each other. We spent the entire trip over preparing ourselves so that the minute we got in-theatre we could execute combat operations.



This briefing graphic, created by VMA-311, details the unit strength of the various squadrons assigned to MAG-13 during OIF I (*Lt Col Mike Hile*)

'The next step was to actually fly as many sorties as possible so as to allow the deck personnel to develop procedures that allowed them to move aeroplanes on the flightdeck, launch and recover them in waves, refuel and rearm them and then go and do it all again. By the time we arrived off the coast of Kuwait we were pretty confident in our abilities to undertake sustained combat operations from *Bonhomme Richard*.'

Lt Col Clyde Woltman was MAG-13's executive officer during OIF, and he helped Col Savarese and the squadron COs prepare for OIF;

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'In August 2002, whilst serving at MCAS Yuma, I was picked up as group executive officer for MAG-13. Shortly after I started work in my new post my CO, Col Savarese, told me, "Clyde, we are going to war and I want you to help me make the 'Harrier Carrier' concept work". I subsequently deployed with the rest of the MAG-13 staff aboard *Bonhomme Richard*. Our passage to the NAG was not uneventful as we were forced to extend our port call in Guam by a few extra days so that repairs could be carried out on the ship's engines.

This VMA-311 jet was photographed whilst being refuelled and rearmed at Ahmed Al Jaber FOB on 28 March 2003. The pilot usually remained strapped into the jet during this procedure, being updated on potential targets that he would be tasked with attacking once he had departed the FOB and flown back into Iraq (*Maj Doug Glover*)

'As we got closer to the AOR, we increased our level of flight training. These sorties gave me an opportunity to familiarise myself with the Litening II pod and develop tactics for its use in combat based on the geometry of what it could see on the ground. We continued our training once in the AOR, and prepared for the start of war in March.

'We had received some intel in the final weeks of OSW that the Iraqi troops along the border with Kuwait – especially those in the artillery units – might surrender quickly once the fighting began. If they were not firing and seemed to be giving up, we did not want to bomb them.'

Shortly after *Bonhomme Richard* arrived in the NAG in late February, Lt Col Mike Hile and several other senior pilots from both the Harrier II units were briefed on OSW operations, as he recalled;

'On the afternoon of 26 February, we were flown by helicopter to Ahmed Al Jaber to receive OSW in-briefs. VMA-311 flew its first training sortie over Kuwait on 3 March, and the following day we utilised the FOB at Ahmed Al Jaber for the first time – we sent 22 Marines to the base to support turnaround operations ashore. On 5 March Maj Gen Amos visited *Bonhomme Richard* and briefed us on the order of battle and expected near-term events. Due to poor weather, we were not able to fly our scheduled OSW mission that day. The next day Majs Annibale and Blake flew VMA-311's first OSW missions, the pilots identifying tactical targets on the ground in Iraq on these first sorties. Night OSW missions commenced on 10 March, and we also used the FOB at Ahmed Al Jaber to support combat flights from this date onwards. VMA-311 flew 58 OSW sorties totalling 81 flying hours prior to OIF commencing.'

Preceding VMA-311 in-theatre by a full two weeks was its six-aircraft Detachment A, which had joined 15th MEU-SOC and its air component, HMM-161, aboard *Tarawa* just prior to the vessel departing San Diego for the CENTCOM AOR on 6 January 2003. Whilst LHA-1 steamed towards the NAG Harrier II pilots flew takeoffs and landings to maintain proficiency and practised their tactics with the Litening II pod. *Tarawa* arrived in the NAG on 10 February 2003 and started flying OSW missions nine days later. VMA-311 Detachment A had completed 23 OSW missions totalling 36.4 hours by the time the detachment was reassigned from 15th MEU-SOC to MAG-13 at the end of February.

RIGHT
Pilots assigned to VMA-311 'Det A' aboard LHA-1 during OIF. In the front row, from left to right, are Capts Duane Rivera, Michael Black and Craig Shaffner. Standing, from left to right, are Capts David Moore and Ben Krippendorf, Maj Brad Gering, Capt Matt Parker and Majs David Forrest and Rob Schroder. The AV-8B+ behind them was assigned to detachment commander, Maj Bradford Gering, the aircraft being adorned with a one-off 'sharksmouth' and a bomb tally just forward of the intake (*Col Brad Gering*)

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A Night Attack Harrier II from VMA-211 returns to *Bonhomme Richard* at the end of a night mission during OIF I. VMA-211 and VMA-311 were allocated the 0200 hrs to 1200 hrs slot during OIF I, which meant that the squadrons had to undertake both day and night missions. Pilots were duly split up into day and night teams based on their flying experience (*US Navy*)

As Lt Col Hile mentioned earlier in this chapter, when OSW came to an end Maj Gen Amos and his staff briefed the 'Harrier Carrier' units on the part they would play in ensuring a Coalition victory. This news posed something of a challenge to the squadrons aboard *Bonhomme Richard*, as Lt Col Vest explained;

'The biggest hurdle we faced once in-theatre was the fact that we could only fly between 0200 hrs and 1200 hrs. *Bonhomme Richard* was one of five L-class amphibious assault ships operating Harrier IIs in the NAG, whilst VMA-214 flew its jets from Ahmed Al Jaber. MAG-13 was tasked with organising its squadrons in such a way that they could supply 24-hour coverage to I MEF. We were given the 0200 hrs to 1200 hrs slot, which meant that our pilots would have to cover both day and night operations. I duly broke the squadron into two teams – a day team and night team – based on experience. I kept myself and my operations officer, Maj Mike Goth, and two experienced pilots on the daytime schedule so that we could train up the less-experienced junior pilots when not flying missions.'

OIF began during the night of 19-20 March 2003 when USAF F-117s struck at a bunker suspected of housing Saddam Hussein and 40+ Tomahawk Land Attack Missiles (TLAMs) hit key military and government sites in and around Baghdad. The following morning Coalition forces initiated three major advances into Iraq, the US Army's V Corps thrusting across the border of Kuwait into Iraq towards Baghdad from the southwest, the Marine Corps' I MEF heading north from southeastern Kuwait and the British Army's 1st Armoured Division penetrating southern Iraq and heading for Basra. Coalition aircraft, including Harrier IIs, immediately commenced strikes on battlefield targets and provided CAS for the advancing ground forces.

One of the first pilots over enemy territory was Lt Col Vest;

'Things started to happen pretty quickly on the ground following the TLAM attacks on Baghdad. Shortly after the missile strikes I walked into VMA-211's ready room aboard *Bonhomme Richard* on what we now know was the first day of the war to be told that I would actually be leading the first section of Harrier IIs from the ship into Iraq! It was an eventful mission, even though we did not drop any weapons. This was because the Iraqi units in the area we had been sent to appeared to be in "capitulation mode". We had been thoroughly briefed in the lead up to OIF on the strict positive identification criteria in place for this campaign. During the final weeks of OSW Coalition aircraft had dropped a lot of leaflets telling Iraqi troops that if they capitulated they would not be hurt. There were certain things that they could do with their equipment, like put their artillery in travel mode, that would indicate they had capitulated.'

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With the commencement of OIF, VMA-311 Detachment A aboard *Tarawa* flew regular daily sorties coordinated through MAG-13 and VMA-311 in support of the ATO. Maj Bradford Gering, a senior member of VMA-311, led the detachment, which consisted of 84 Marines, nine pilots and six AV-8Bs. 'Our pilots are contributing greatly to what is going on right now', Maj Gering told reporters during OIF. 'They are working non-stop to support the Coalition effort'. Capt Duane Rivera, the detachment's junior pilot, added, 'The hours are long, but the motivation comes from the Marines when they are calling for our assistance. It's no trouble at all to stay motivated to help the guys on the ground'.

Maj Bradford Gering's Harrier II patrols over Baghdad on 1 May 2003. The various markings unique to this 'Det A' jet are clearly visible in this photograph (*Col Brad Gering*)

VMA-311 CO Lt Col Hile was quick to recognise just how important the Litening II pod was to the Harrier II's mission effectiveness in OIF;

'The capabilities of the targeting pod were immediately appreciated. Soon after combat operations began, the Harrier II became the preferred aircraft for strikes because of its ability to positively identify tactical-size targets from medium altitude. Stringent ROE requirements in OIF dictated weapon engagement parameters, with positive identification of the target being the most important of them all. Litening II gave the pilot of a suitably equipped Harrier II the ability to do this by day or night, above the SAM and AAA threat, at medium altitude.'

The AV-8B had suffered losses to Iraqi AAA and shoulder-launched SAMs in *Desert Storm* because the jet lacked the ability to accurately attack targets from medium altitude. The advent of the Litening II pod all but removed this threat in OIF, as MAG-13's Lt Col Woltman, who saw action in 1991 during the freeing of Kuwait, explained;

'I personally do not recall being shot at as aggressively as I had experienced in *Desert Storm*, despite spending plenty of time over enemy territory in what proved to be a target rich environment. We ran a 24/7 operation, initially flying a lot of missions that usually involved multiple trips to the tankers in between bombing target after target. We took advantage of the Litening II pod whenever possible. Indeed, the Harrier II fitted with a Litening II pod quickly became the weapon of choice for the Marine Corps, as the F/A-18 did not have this capability at the time. Its older, less capable Nite Hawk pod was often found wanting when it came to getting good intel on potential targets.

'We ended up doing a lot of ISR because the accuracy and fidelity of the FLIR picture achieved by the Litening II pod was remarkably clear – you could see the targets very nicely from medium altitude 24 hours a day. We did not intentionally set out to fly ISR missions – we always carried GBU-12s or GBU-16s, as well as the pod, and went after targets as directed by the FACs. Sometimes, target identification from the cockpit could prove to be tough even with the pod as our jets were fitted with raster-scan, green-image multi-function displays. These were usually okay, but nowhere near as nice as the colour TV that we ran the pod footage through in the intel shop back at base post-mission.

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VMA-311 'Det A' pilot Capt Michael Black took this self-portrait over Iraq on 4 April 2003. The AV-8B Night Attack jet behind him boasts an impressive bomb tally beneath its cockpit (*Capt Michael Black*)

'The combination of the Litening II pod and well-trained pilots who could do buddy bombing gave a typical Harrier II formation a wide range of mission capabilities. In the old days, such as in *Desert Storm*, you would have to drop four to six bombs to knock out a target, but with the Litening II pod and LGBs you could use one bomb per tank. We had a good image of one guy who dropped a GBU-16 on a tank and flipped it upside down. On another occasion Harrier IIs were sent to Al Kut, 100 miles southeast of Baghdad, to find an Iraqi tank battalion. Although no tanks were found, when the pod's mission footage was reviewed by one of the enlisted intel guys back aboard the ship he spotted tank tracks. Following these into a village near Al Kut, he quickly discovered multiple tanks hidden among buildings. This was brand new intel, so we marked the target and went back after sunset and picked the tanks off one at a time. The accuracy, capability and effectiveness of the Harrier II/Litening II/LGB combination was amazing.'

The Al Kut attack was particularly noteworthy, as according to Col Savarese, 'a single wave of 12 Harrier IIs from *Bonhomme Richard* succeeded in completely destroying the Republican Guard Baghdad Division's one and only armoured tank battalion, which had been found by MAG-13's intelligence team hiding in Al Kut, after it had been captured on video by a Litening II targeting pod on a Harrier returning from a sortie. That one mission allowed I MEF's push on Al Kut to continue without a pitched battle'.

Col Savarese also explained that Al Kut was the scene of another memorable mission for Harrier IIs from *Bonhomme Richard*;

'One of our pilots saved Lt Col Oliver North's bacon, as well as a few others. He was embedded as a Fox News broadcaster, and he went down in a UH-1 with some engine trouble near Al Kut. The helicopter didn't crash, but I think they had to land close to An Numaniyah. Once on the ground they immediately started receiving fire from enemy artillery, mortars or such, with enemy infantry moving in from the east. We had a section of Harrier IIs airborne at the time, and our pilots engaged, taking out the enemy position closest to the helicopter and providing delaying action against the enemy infantry moving west, allowing Marine rescue helicopters into the landing zone to get those guys out of there. It wasn't until afterwards we found out that Oliver North was one of the guys in that helicopter. We were pretty proud of that.'

VMA-311 pilot Maj Peter S Blake was one of the Harrier II pilots from *Bonhomme Richard* who attacked targets in and around Al Kut;

'There had been a lot of targets there, including tanks, trucks in revetments and artillery positions, but when I MEF reached the city it met little resistance. For us this really meant that we had done our job properly, having softened up Iraqi opposition ahead of the Marines rolling north.'

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A VMA-311 'Det A' AV-8B commences its takeoff run from LHA-1 on 25 March 2003. This aircraft is carrying a 1000-lb GBU-16 LGB beneath its port wing. Relatively few weapons of this size were employed by Harrier IIs after the first few days of OIF I (*US Navy*)

Lt Col Vest was in the vanguard of the operations specifically aimed at neutralising the threat posed by the well-equipped Iraqi Army;

'For the first two weeks of OIF VMA-211 flew air interdiction-type missions almost exclusively. We would fly to a kill box and be told by a controlling agency, "If you can find any legitimate targets, you are cleared to engage them". We had extremely detailed information on the location of Iraqi artillery and armour in particular, and we studied overhead imagery of these targets during our pre-mission briefings aboard *Bonhomme Richard*. When the pilot walked to his aircraft, he had a general idea of where the artillery and/or armour – including tanks and armoured personnel carriers – was, marking this clearly on his maps. Armed with this intelligence, he had a pretty good idea of where to start looking for the enemy once in Iraq.

'Consequently, unless we had problems with the weather, we were able to go into these areas, locate tanks, artillery and, on one occasion near Al Kut, an SA-6 SAM, and lock them up with the Litening II pod. Once the laser was on the target, two GBU-12s were dropped to knock it out. Basically, with the targeting pod and the LGBs, if you could see it, you could hit it with one bomb. This was usually enough to destroy a tank-sized target.'

With the AV-8Bs providing critical support to I MEF, a small group of maintainers from the 'Harrier Carriers' were sent to Ahmed Al Jaber to refuel and rearm ship-based jets between missions so that they could get back into the fight as quickly as possible. Later, two FARPs were established in Iraq, one at An Numaniyah (a former Iraqi air base) and another on a section of highway south of Baghdad – both were stocked with fuel, weapons and support troops that allowed Harrier IIs to operate 400 miles from their ships in the NAG. Often, AV-8B pilots would fly from their ship or Ahmed Al Jaber, strike a target and then land at one of these FARPs. Here, their jets were swiftly rearmed and refuelled and then kept on readiness awaiting the call to attack nearby targets, before flying back to their ship or Ahmed Al Jaber. Such operations again underscored the benefits of the Marine Corps' concept of expeditionary planning and multiple basing options for the Harrier II.

Lt Col Woltman was one of those pilots who made use of the FARPs;

'As our forces – Marines as well as Army – headed north, we had to fly further from the boat, and that was when we started refuelling and rearming Harrier IIs at the ex-IrAF base at Al Numaniyah, five miles south

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A section of AV-8B+s from VMA-311 head north into Iraq. The jet closest to the camera, flown by Maj Peter Blake, is armed with a GBU-12. The second jet, with MAG-13's Lt Col Clyde Woltman in the cockpit, is carrying a Litening II pod (*Lt Col Peter Blake*)

of Al Kut. We had fuel bladders and ordnance available at the site, and pilots could sit on the ground ready to fly standby CAS as and when requested. We ended up flying 200+ sorties from that facility, amply demonstrating the flexibility of the Harrier II.

'Being the XO of MAG-13, I didn't get to fly quite as often as the junior pilots due to the administrative demands of my job. When assigned a mission, pilots would sortie in whatever jet was available. We tried to optimise the make up of the two-aircraft sections so that one of the jets would be a radar bird, as the pilot in the latter aircraft had more situational awareness when it came to locating targets in poor weather. The other machine would be a Harrier II Night Attack jet. We tried to have pods on all of the aircraft sent into Iraq, but if there were not enough available due to serviceability issues – our technicians could usually fix them quite quickly – we would fit the Litening II to the Night Attack jet as the latter was a bit lighter than the AV-8B+. We sometimes sent out a formation of three jets, two of which would have pods and one LGBs only.'

Pilots from VMA-211 and VMA-311 remained in the thick of the action through to the very end of OIF I. Occasionally they were shot at by Iraqi forces attempting to defend themselves from near-constant attacks from the air. Capt Brian Kaczorowski of VMA-211 was targeted during a mission he flew with Maj Richard Musser on 8 April;

'Concern was raised again over forces moving from the eastern side of the country to harass Coalition troops and supply lines in central Iraq. After about ten minutes of searching with no indication of mass movements, we spotted a revetted vehicle that was positioned to engage traffic along a nearby highway. After reporting its position and condition, we received permission to engage and destroy it with a single GBU-16 1000-lb LGB. On returning to the area to assess the damage, and look for additional targets, I was locked up and received missile launch indications from several ground threats. I manoeuvred and expended chaff in an attempt to defeat the radar, but after a few seconds I received indications of a second launch. We were at an altitude that was beyond the range of the smaller SAM systems that had locked onto us. I lowered the nose to preserve energy and then began a climb to

Capt Jason Duncan, Sgt Gonzales (avionics technician), Sgt Harrison (ordnanceman) and Lt Col Mike Hile pose for the camera at An Numaniyah FARP during the evening of 10 April 2003. The Marine Corps established a FOB at this former IrAF airfield during the final days of OIF I, and used it to rearm and refuel AV-8Bs during the capture of Baghdad (*Lt Col Mike Hile*)

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regain altitude, while continuing to expend chaff. The missile tracked for about 12 to 15 seconds, after which it dropped away and we left the area.'

Capt Kaczorowski's CO, Lt Col Vest, repeatedly briefed his pilots throughout OIF on the importance of positively identifying their targets before employing ordnance;

'For VMA-211, the trick was to positively ID the target and then make sure it was not located near something that could possibly suffer collateral damage in an attack – schools, hospitals and mosques were all high-risk buildings that needed to be avoided if at all possible. If the pilot was uncertain about collateral damage issues, he could call the controlling agency and either get permission to engage the target or simply take video imagery of it for review back aboard the ship. This would give MAG-13 the chance to decide whether the target was worth bombing, and if so, devise a way to attack it that would lower the potential for collateral damage.

VMA-311 'Det A's' Capt Michael Black took this photograph of his wingman during a patrol over Baghdad on 24 April 2003 (*Capt Michael Black*)

'I think the most important thing we brought to OIF was our ability to go out and precisely identify targets, and then clinically engage them with just a single smart bomb. From a Harrier II pilot's perspective, this was quite a departure from the way we had originally been trained to fly the jet. As Marine attack pilots, our primary mission has traditionally been to protect our brethren on the ground, either through interdiction missions or via CAS directly over the battlefield. In OIF, positively identifying the target and ensuring that its destruction did not contravene the collateral damage estimate stipulated by the theatre commander were of critical importance. Numerous potential targets were ruled out because one or both criteria could not be met – especially with the 10,000 ft hard deck restriction mandated by 3rd MAW – despite troops on the ground requesting their destruction. Such rigid ROE was a constant source of frustration to us.

'On one occasion near a mosque in Baghdad, Marines were taking sniper fire, and I had a section of VMA-211 jets overhead. One Marine was killed and another wounded, and there was a lot of panic over the radios. My pilots could hear the Marines calling for help on the ground. Their officer said, "Wait a second, we cannot use fixed-wing air here. We have too many friendlies in close and I can't put a 500-lb bomb into the side of a Mosque to kill a sniper. We are going to have to figure out another way to do this".

'When the pilots came back to the ship they were shaking their heads because they felt helpless and they felt they could not help their fellow Marines on the ground. It was only after returning to *Bonhomme Richard* that they could really put things into perspective, however. The Marines on the ground were doing a movement to contact. They were moving through the streets of Baghdad trying to get fire from pockets of resistance still in the city. One Marine did die and ten were wounded in this incident, but had

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Having returned to LHD-6 still armed with both GBU-12s, this AV-8B Harrier II+ from VMA-311 is rolled back into position for lashing down on the flightdeck on 18 April 2003. This aircraft has a small bomb tally marked beneath the cockpit. *Bonhomme Richard* served as a command centre for MAG-13 during OIF I (*Lt Col Mike Hile*)

we put a GBU-12 500-lb LGB into the mosque we could have injured more Marines and we would have caused a tremendous amount of collateral damage to an important religious site, possibly killing many civilians in the process. We would have killed the sniper and potentially won the battle, but lost the war in the eyes of the Iraqi people, so to speak. That was a hard concept for the pilots to understand at first until they had experienced it for themselves.'

There was a loophole when it came to the various ROE enforced during OIF. If Marines on the ground were faced with a deadly threat, all altitude limitations were lifted and pilots were expected to do everything possible to assist their comrades on the ground. In the words of Jay Stout, 'This meant everything short of raising the canopy and opening fire with their 9 mm pistols'.

Bonhomme Richard and its embarked VMA-311/211 team were deployed for 96 days, and Harrier II pilots flew on all but ten of these days. Thirty-two per cent of the missions flown during the cruise were OSW tactical reconnaissance sorties, 50 per cent were in support of OIF operations and the remaining 18 per cent were training missions. Overall, VMA-311/211 pilots flew 680 sorties for a total of 1230 flying hours. Despite the intensive operational tempo throughout March and April, the AV-8B full-mission capable rate for the team was between 80-85 per cent. During OIF, VMA-311/211 delivered 601 GBU-12s, 271 GBU-16s, 141 Mk 82s, 64 CBU/Rockeye cluster bombs, 49 Mk 83s, ten AGM-65E Maverick laser-guided missiles and four Zuni rockets. These weapons were credited with destroying 65 vehicles, 12 artillery pieces, 25 tanks, eight APCs, 18 buildings, five rocket launchers, one bridge, one SAM site, one aircraft and 15 other defensive positions.

By the end of OIF, the six aircraft and ten pilots of VMA-311's, Detachment A embarked in *Tarawa* had flown 183 combat sorties for a total of 337.9 combat flying hours. Weapons expended included 57 GBU-12s, 30 GBU-16s, four Mk 82s and an AGM-65E Maverick, resulting in the destruction of 12 artillery pieces, seven tanks, nine vehicles, five APCs, ten buildings and one aircraft.

Despite these impressive statistics, Lt Col Mike Hile, CO of the largest naval tactical aviation squadron supporting major combat operations during OIF, felt that the contribution made by the 'Harrier Carriers' to the victory in Iraq did not get the recognition it deserved;

'An overlooked contributor to the Harrier II's success were the "airfields" from which the aircraft mostly operated – the amphibious assault ships in the NAG. Any aircraft carrier is a ready-to-deploy "airfield", with communications links, maintenance, berthing and messing facilities already inherent. Instead of the many months required to build an airfield to support TACAIR operations, there is only the loading and transit time to contend with before these bases are operational – which in this case was only six weeks. Additionally, aircraft can be prepared for combat

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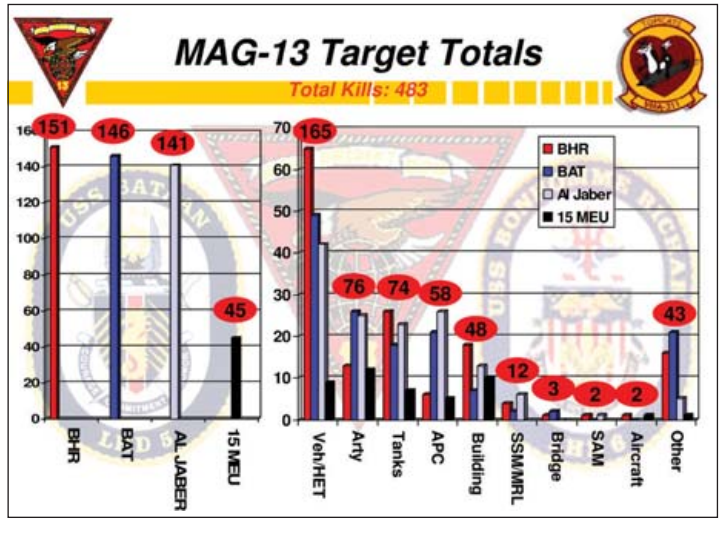
during their transit, instead of before making the trans-world flight to an airfield that may not be ready to support them, which was the case in *Desert Shield*. Vital communication links are contained within the ship, and thus are ready to "plug and play" into any theatre of operation. Also, as the amphibious assault groups were forward deployed in the northern Arabian Gulf, this allowed Harrier IIs to operate without the need for tanker assets until missions were required deep into Iraq.

The pilots of VMA-311 pose for a squadron photograph aboard LHD-6 at the end of OIF I. Kneeling, from left to right, are Capt Scott Anderson, Maj Rudy Whalen, Capt Jason Duncan, Ft Lt Steve Long (RAF exchange officer) and Capt Arnold Dale. Standing, from left to right, are Majs John Crane and Peter Blake, Lt Cols Ed Sexton and Mike Hile, Maj John Thomas and Capts Antolino and Brian Kaczorowski. Sitting on the aircraft, from left to right, are Capts John Havner, Bart Haynes and Gossen. This aircraft has also been adorned with a bomb tally, as well as a small Iraqi flag (*Lt Col Mike Hile*)

'As part of the OIF aerial campaign, the Harrier IIs utilised a FARP 60 miles south of Baghdad – a facility no other TACAIR aircraft was able to use. This FARP served as a "tanker on the ground" to help sustain flight operations deep into Iraq when tankers were not available. Lastly, the maintenance facilities aboard the amphibious assault ships greatly aided the sustainment of flight operations throughout OIF. The readiness rates of all four Harrier II squadrons afloat either maintained a high 80 to 85 per cent full mission capable readiness or quickly climbed to that level shortly after arriving, while the one Harrier II squadron ashore in Kuwait arrived in-theatre with a readiness rate in the high 90 percentages. However, due to support and supply limitations, this dropped to as low as 65 per cent full mission capable towards the end of major combat operations.

'With the end of major combat operations one could argue that the six US Navy amphibious assault ships, with the 60 Harrier IIs and 91 helicopters on their flightdecks and the Marine infantrymen they transported, brought more combat firepower to OIF than any other type of shipping. Every Harrier II sortie from a "Harrier Carrier" was launched to strike enemy targets, and it was to be the soldiers of the US Marine Corps who marched through downtown Baghdad on their way to Tikrit as they "secured" Iraq. That the Harrier II was able to achieve all these impressive results is due to an inherently sound design and to years of investment and commitment by the Marine Corps' leadership. It is further testimony to the aircraft's capability and the US Marine Corps' professionalism that during OIF the Harrier II suffered no combat losses. This also disproves the earlier reputation of STOVL aircraft being particularly vulnerable to SAMs and AAA, and having limited performance.'



According to this graphic, Harrier IIs were responsible for destroying 483 targets during OIF I (*Lt Col Mike Hile*)

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OIF I – VMA-542, VMA-223 AND VMA-231

The six jets of VMA-231 'Det A' had been at sea with 24th MEU-SOC/ HMM-263 aboard USS *Nassau* (LHA-4) for five months prior to their commitment to OIF I. The AV-8B+ closest to the camera in this photograph, BuNo 165391, had the dubious distinction of being the only Harrier II to be lost during OIF I when it crashed while approaching *Nassau* during a night recovery on 1 April 2003. The pilot successfully ejected and BuNo 165391 remained afloat long enough for it to be recovered (*US Navy*)

In mid January 2003, Harrier II squadron VMA-542 embarked in *Bataan* and sailed with the vessel from Norfolk on the 20th of that month. Eight days earlier, *Kearsarge*, with VMA-223 onboard, had left the same port bound for the NAG. Once in-theatre they would join up with *Nassau*, which had been on a scheduled deployment to the region since late August 2002. LHA-4 had a six-aircraft detachment of AV-8Bs from VMA-231 (assigned to 24th MEU-SOC's HMM-263) on board. Once in the NAG, these vessels formed Amphibious Task Force East.

Having arrived off Kuwait by late February, *Bataan* disembarked more than 1500 Marines from Regimental Combat Team (RCT) 2, along with 175 vehicles and 220 tons of cargo. Harrier IIs, pilots and support personnel were then shifted among the trio of ships in Amphibious Task Force East. The 16 jets from VMA-542 aboard *Bataan* were joined by ten AV-8Bs from VMA-223 for OIF, leaving *Kearsarge's* flightdeck free to support helicopter operations. The six Harrier IIs of VMA-231 remained aboard *Nassau*. Reporting up through MAG-13, the trio of units in Amphibious Task Force East were responsible for flying operations from 1200 hrs through to 2200 hrs each day.

Capt (now Lt Col) Michael Perez, who had seen combat in OEF the previous year with VMA-542, embarked in USS *Wasp* (LHD-1), was one of the pilots assigned to the unit for OIF;

'Having sailed to the NAG aboard *Kearsarge*, once the vessel checked into the CENTCOM AOR VMA-223 cross-decked all of its jets to *Bataan*. The unit had a six-jet detachment preparing to deploy with 22nd MEU-SOC aboard USS *Iwo Jima* (LHD-7) in March 2003, so it only had ten Harrier IIs available to embark in *Kearsarge* when the vessel sailed for the NAG.

'*Bataan* was chosen as the primary "Harrier Carrier" of Amphibious Task Force East because

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A VMA-231 'Det A' Harrier II+ accelerates along the flightdeck of LHA-4 at the start of an OIF I mission on 7 April 2003. The jet carries a Litening II pod beneath its starboard wing and a GBU-12 LGB on the opposing pylon (*US Navy*)

it had supported early OEF missions over Afghanistan in 2002. VMA-223's six-aircraft detachment, assigned to HMM-365 and 26th MEU-SOC, had flown from the vessel while it sailed off the coast of Pakistan. This meant that the ship's crew were familiar with wartime operations and the "Harrier Carrier" concept, which saw TACAIR units putting aircraft into the air with as much ordnance on them as possible, rather than having a peacetime mindset where the focus was more on what was showing next on movie night or where the next port call was going to be!

'Once we arrived on station in the NAG, we sent two of our aircraft to the west coast "Harrier Carrier" *Bonhomme Richard*, as it was short of jets. This left both vessels with 24 aircraft each. Although this was a somewhat daunting number of AV-8Bs to have on an amphibious assault ship, which usually deployed with just six Harrier IIs onboard, we felt confident that both ships could operate successfully on a war footing.

'Once in the NAG, and having sorted out the allocation of aircraft, Amphibious Task Force East committed Harrier IIs to OSW. This soon became Operation *Southern Force*, where the goal was to put a massive number of jets into the air every day over Iraqi positions in the No-Fly Zone so that the enemy would not know when OIF had properly started. I flew my first *Southern Force* mission on 9 March, and VMA-542 remained committed to this operation for about two weeks in total.

'We put these sorties to good use, as we were given specific targets – where Iraqi ground forces and other defences were thought to be located – to reconnoitre with our Litening II pods. We went in and looked at these sites, recording relevant target data to give to the intel types to confirm what was there. These missions proved to be useful to CENTCOM, as the imagery revealed that a lot of the units in forward positions

An AV-8B+ prepares to land aboard USS *Kearsarge* (LHD-3) on 3 February 2003, the vessel having only departed Virginia six days earlier. Once LHD-3 checked into the CENTCOM AOR, VMA-223 cross-decked all of its jets to *Bataan*. The unit had a six-Harrier II detachment preparing to deploy with 22nd MEU-SOC aboard USS *Iwo Jima* (LHD-7) in March 2003, so it only had ten Harrier IIs available to embark in *Kearsarge* when the vessel sailed for the NAG (*US Navy*)

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Two aircraft from VMA-542 taxi out on an OSW mission at Ahmed Al Jaber on 5 March 2003, the jets having been flown ashore from *Bataan* so that their pilots could be fully briefed on the specifics of the flight. MIM-104 Patriot surface-to-air missile batteries can be seen behind the aircraft (*US Marine Corps*)

The pilot of this Night Attack Harrier II from VMA-542 is just moments away from being given the signal to launch on an Operation *Southern Force* mission on 18 May 2003. The aim of *Southern Force* was to put a massive number of jets into the air every day over Iraqi positions in the No-Fly Zone so that the enemy would not know when OIF had properly started. VMA-542 remained committed to this operation for about two weeks in total. Both this aircraft and the Harrier II behind it are armed with GBU-12s (*US Navy*)

had deserted, leaving these sites undefended. On one of these missions, however, we did get shot at by AAA. Even though the tracer was a few miles away, it brought home to us that we were indeed in a combat zone, and not just flying a training mission over a bombing range.

'At the start of the war we still had fewer Litening II pods than aircraft, and there were flight limitations for landing when carrying a pod and a 1000-lb GBU-16 bomb. Since we could not bring both the bomb and the pod back aboard because of weight issues relating to the Harrier II's hovering performance when the weather began to warm up, we sometimes had to drop the GBU-16 before landing. Everyone complained about this, so the test pilots at Naval Air Weapons Station China Lake, in California, flew a series of quick proving flights in their AV-8Bs to clear the carriage of the pod and the smaller 500-lb GBU-12, and this helped out significantly.

'Our number one focus once OIF commenced was knocking out Iraqi artillery – either guns or rockets – as CENTCOM was worried that weapons of mass destruction such as gas shells could be fired at Coalition troops. Iraq had frequently fired such weapons against Iranian forces during the Iran-Iraq War in the 1980s. We actively searched for, and attacked, artillery either with GBU-12s or GBU-16s – they both did the trick. In my experience the GBU-12 was more agile and could be manoeuvred more effectively just before impact thanks to its smaller size.

'At this time pilots flying the Harrier II had no wind model figures for the high-altitude delivery of LGBs, as the aircraft had previously been viewed exclusively as a CAS machine that would always drop ordnance from 8000 ft or less. With the implementation of a 10,000 ft hard deck for bomb delivery in OIF, clearly something had to be done to allow pilots to deliver LGBs with the accuracy that the ROE required. Weapons specialists back home quickly figured out that the time-of-fall for the GBU-12 and GBU-16 would be less than ten seconds from 10,000 ft, so the winds at release would be the same all the way to the ground. However, when dropping a GBU-16 in a dive-delivery from 25,000 ft, with 50-knot computed winds at that altitude but surface winds of only ten knots, the bomb's terminal accuracy could be adversely affected during its 40-second time-of-fall. Fortunately, the large blast radius associated with the GBU-16 usually made up for this modest inaccuracy.

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Sporting a small set of teeth just aft of its radome, as well as 'eyes' beneath its windscreen, this Harrier II+ of VMA-223 is lined up ready for takeoff from *Bataan* on 23 March 2003. The aircraft is carrying a 1000-lb GBU-16 LGB beneath its port wing, the weight of this weapon being offset by a Litening II pod on the starboard inner pylon. Harrier IIs were rarely seen in OIF I without a pair of 300 US gallon drop tanks beneath the wings due to the aircraft's somewhat modest range (*US Navy*)

'On *Bataan* I was one of the landing signal officers [LSOs], a section lead and the WTI for the squadron, so I had my hands full during OIF. I had to wave others aboard, plan and fly combat missions and then try and get some sleep. Our ship worked from 1400 hrs to 0200 hrs, and the other ship flew from 0200 hrs to 1400 hrs, so we split days and nights. I started out on nights, flying as late as 0200 hrs and then working on planning for future missions. We soon found out that the missions we were being tasked with were so complex that we needed to do more planning, train to perform the mission and then go and fly it, by which time it was too late to repeat this cycle for the next day's events. We quickly created planning teams made up of pilots not scheduled to fly the next day, and it was their job to prepare missions for the guys who were on the flight programme while the latter got some rest.

'Following a few hours of sleep, pilots would get up, brief and practise a planned mission, go fly it, then come back to the ship, land, debrief and then undertake planning for the next day's missions. Aside from doing all of this, I was added to one of the LSO rotations. It was "good" busy during OIF, as we knew we were doing good work supporting our troops in-theatre. We worked so hard that often we did not have a good grasp on the progress of the war. About ten days into the conflict a Fox News team visited the ship, and they gave us feedback about the war and information about our troops moving north.

'On the first night of the war we did not fly because many of the cruise missiles trying to hit Saddam Hussein and Iraqi air defence targets flew through a corridor right over our ship. The next night we went in, however, flying CAS for the penetration by the Marines into Iraq. We would conduct a mission directly from the carrier, and if we still had weapons after this initial attack, we would refuel from a Marine KC-130 tanker and then go after a second target. If we needed weapons, we would land at Ahmed Al Jaber and rearm and refuel, before hitting another target. It was pretty amazing to see how a single squadron with augmentation could refuel, rearm and do any quick maintenance on their jets at a FARP, alongside other jets that came through the base from "Harrier Carriers" in the NAG ships. During the initial phase of OIF we would cycle through Ahmed Al Jaber a few times a day – I recall doing this three times on one day – before going back to the ship.

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A section of Harrier IIs from VMA-542 top up their fuel tanks from a KC-130T of VMGR-452 over southern Iraq on 29 March 2003. This photograph was taken by Capt Doug Glover from the back seat of an F/A-18D from VMFA(AW)-533 while he and his pilot waited their turn to refuel. 'The AV-8Bs were filling the Strike Coordination and Armed Reconnaisance [SCAR] role due to the capability of their Litening II pods', Glover recalled. 'During the critical phases of OIF I, when airborne Hercules tankers were in limited supply, only Marine Corps aircraft flying SCAR or FAC(A) [Forward Air Controller (Airborne)] missions were tasked with taking fuel from the KC-130Ts' (*Maj Doug Glover*)

A close-up view of the VMA-542 jets taking on fuel high over southern Iraq on 29 March 2003. Typically for OIF I, the Night Attack Harrier II is carrying a Litening II pod while the AV-8B+ is armed with a GBU-12. Both aircraft also have black bomb symbols just forward of their engine intakes (*Maj Doug Glover*)

'As our troops moved north toward Baghdad, it took us almost an hour to fly north to the target areas from the carrier. When tankers were available, we took off from the ship, fuelled up over southern Iraq and then headed. One of the benefits of the Harrier II is that the jet can operate from almost anywhere. Mission planners soon figured out that we did not need to use tankers, which were in constant demand by other aircraft, but could land at a newly established FARP at An Numaniyah. We would take off from the ship, get close to Baghdad and check in with the controllers to see if anyone needed our ordnance straight away. If this was indeed the case, we would go and drop our bombs and then head back to the ship. If we still had weapons after this initial strike, we would land at An Numaniyah, refuel and go into the CAS stack for an air support request.

'It was a point of pride for VMA-542 that its Harrier IIs were the first Coalition tactical jet aircraft to land in Iraq at the old MiG base at An Numaniyah after the Marines had conducted emergency repairs in order to make the airfield functional as a FARP.

'Target allocation in OIF proved to be most interesting, as we would get the daily ATO on the ship from the CAOC and it would tell us which kill box we were to attack. War, however, is often not that predictable, and on most occasions we would check in with the DASC as we entered Iraqi air space, only to be sent to other areas for CAS rather than attack targets in our previously assigned kill box. We soon moved to a more flexible game plan, as on every single sortie I flew there was a change – I never went to the kill box I had briefed from the ATO! OIF was a very dynamic, real-time campaign, which proved very challenging for us. As you received coordinates for a new kill box, you had to figure out where the nearest tanker was, how low could I go on fuel and still hit the target, or did I need to land and refuel or go back to Ahmed Al Jaber or even the ship for more ordnance? We had detailed briefing cards in the cockpit to help us figure out the best options, but we still had to stay on our toes.

'My favourite weapon during OIF was the GBU-12 because it was simple to employ and versatile. You can deliver it in a dive or in level flight, and it is very nimble – I have seen the weapon do some amazing turns in the final attack phase. My second favourite was the Laser Maverick, as it is foolproof and almost impossible to goof up. You just uncage it, the seeker sees the laser illumination from the targeting pod and you shoot it.

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'After the heavy fighting ended, units started to go home, but our squadron flew off the ship to Ahmed Al Jaber and joined VMA-214. The carriers then departed, and we eventually flew home with the aid of tankers in late May 2003.'

VMA-542 pilot Capt Jennifer Dolan spoke about her unit's efforts in OIF I shortly after the conflict had come to an end;

'The "Tigers" flew from "Harrier Carriers" throughout the campaign, operating in the "bomb truck" role. The pilots ranged far north into Iraq, refuelled going and coming, either in the air or at the An Numaniyah FARP, and dropped their ordnance in between. These were long missions that could last up to five hours. They flew CAS for Marines and Coalition troops, but more frequently they were vectored to an open kill box, where they found a target and attacked it. OIF I missions were challenging because there was always the potential for enemy ground fire and dust storms, while night operations from a carrier or a blacked-out FARP could be daunting.

'The FARP used during OIF I at An Numaniyah proved necessary because as the campaign progressed aerial tankers were increasingly in short supply. After flying the 200+ miles up from the NAG, Harrier II pilots needed gas if they wanted more than one pass over the target. The jet's short takeoff and landing capability allowed it to land on An Numaniyah's 8000-ft cratered runway, which had only recently been liberated. It was in poor condition, yet close to the Marines, who needed air support – indeed, it was so close that firefights in nearby Al Kut were visible at night.'

Night landings at the An Numaniyah FARP, which was commanded by Lt Col Ken M Woodward, were a real attention-getter. The co-located An Numaniyah FOB operated lights out and had no covert lighting – light was visible through night vision goggles only. It was a 'big black hole'. Capt Sam Schoolfield and Maj Keith Blakely made the first night landings there on 8 April, relying on a hovering UH-1 Huey helicopter to illuminate the runway for them. The Al Numaniyah FARP supported 203 Harrier sorties during OIF I. Despite the high foreign-object damage potential at the site, no Harrier II engines were dinged or destroyed by Iraqi gravel or debris at An Numaniyah.

During OIF, the Coalition fielded 1801 aircraft of which 1356 were fighters or bombers capable of delivering weapons. These strike aircraft flew about 20,700 sorties that targeted 19,900 Desired Mean Points of Impact (DMPIs), delivering 29,900 munitions of which 19,948 were precision-guided weapons and 9251 were unguided bombs. About 60 per cent of the strikes (12,000 DMPIs) were directed against Iraqi ground forces, which included Republican Guard and regular army units. The rest of the strike sorties were against strategic targets or designated as CAS. The Harrier IIs of the US Marine Corps and RAF contributed nearly eight per cent of the total Coalition sorties flown during the air offensive in OIF.

Knocked out T-55 Main Battle Tanks litter an Iraqi military complex west of Al Diwaniyah during OIF I. The Harrier II force was credited with destroying 74 tanks and tracked vehicles during the campaign (*US Marine Corps*)

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An AV-8B hovers over the deck of USS *Bataan* (LHD-5) in the NAG on 25 April 2003. Harrier IIs from VMA-542 and VMA-223 operated from the vessel during OIF I, completing 884 sorties and dropping 262 LGBs and 128 unguided general purpose bombs on Iraqi targets. Another *Wasp* class amphibious assault ship can be seen in the background (*US Navy*)

Harrier II pilots flying from *Bataan* dropped more than 122 tons of ordnance, most of which were laser-guided 500- and 1000-lb bombs. More than 470 targets were hit during these strikes. As already noted in this chapter, ship-launched AV-8Bs frequently hit their targets and then landed at a FARP – Ahmed Al Jaber and, in the final week of the war, Al Numaniyah – to rearm and refuel and then attack other positions, before flying back to their ship. This again underscored the benefits of the Marine Corps' concept expeditionary planning and multiple basing options synonymous with the Harrier II.

Lt Col Paul Rupp, who served as MAG-13's operations officer throughout OIF, explained why the AV-8B played such a key role in the campaign;

'I think the Harriers IIs were well trusted by the ground folks in the theatre of operations. Not only was the aircraft extremely effective in combat, it was also extremely efficient. They had tremendous tactical aircraft readiness availability, which meant the Harrier IIs were always ready to go. The jet was not used to its full potential in OIF when it came to FARPs and FOBs, but it takes a lot of support and logistics to keep FARPs and FOBs operational.'

During OIF (19 March to 13 April 2003), Harrier II pilots flew 24 hours a day, seven days a week. 'The beauty of the Harrier II is its flexibility', noted MAG-13 CO Col Mark Savarese. 'It is a unique aeroplane that can go anywhere and operate from anywhere, which is why they could fly from our "attack carriers", as I dubbed our amphibious assault ships in OIF. During 26 days of combat operations, we flew more than 2000 sorties and logged more than 3000 combat flying hours. Harrier IIs expended more than 750,000 lbs of ordnance in support of I MEF, dropping some 900 500- and 1000-lb LGBs. And thanks to the Litening II pod, pilots were able to achieve a kill rate of 75 per cent with this ordnance'.

A number of Litening II pods used by VMA-214 were also modified so that they could both receive and transmit live video from Pioneer UAVs via a downlink. This enabled ground FACs to review imagery and identify potential targets in real time.

Harrier IIs from *Bataan* crowd the Ahmed Al Jaber FOB on the morning of 2 April 2003 as they are refuelled and rearmed prior to heading back into Iraq to attack more targets in support of I MEF's drive northwards on Baghdad (*Maj Doug Glover*)

'I think we were highly effective because we had an incredible team of great individuals working together', Col Savarese explained. 'Everybody gave 110 per cent to ensure that we had both the equipment and the readiness, and I believe we had top notch squadron commanders too'.

Gen Randolph Pate, Commandant of the Marine Corps from 1956 to 1959, once said 'vertical takeoff and

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These jets from VMA-223 (in the foreground) and VMA-542 were photographed by Capt Doug Glover on the morning of 2 April 2003 as he taxied out on a mission from Ahmed Al Jaber (*Maj Doug Glover*)

landing characteristics are an ultimate requirement for all Marine aircraft in support of amphibious operations in the future. Obtaining a STOVL capability is, therefore, vital to Marine aviation'. According to Col Savarese, 'the AV-8B Harrier II has fulfilled those characteristics. The contribution the aircraft made during OIF validated STOVL basing flexibility as a fundamental feature for responsive offensive air support'.

Col Savarese's boss, Maj Gen James Amos, remarked;

'Just as Marine aviators have done in previous conflicts, the "Flying Leathernecks" of the 3rd MAW have taken to the air, day and night, to support Marines on the ground. Our priorities were things that could kill our infantry from a distance. Finding the hidden artillery was challenging due to the poor weather. We took a significant concentration of our Harrier IIs and put them on two large amphibious ships. So we ended up with two "Harrier Carriers", and they operated 24 hours a day. The AV-8B Harrier II has played a prominent role in destroying enemy armour and other targets. The Harrier IIs have really jumped in on this thing, and the magnification and clarity of their Litening II pods has given us amazing granularity.'

Maj Gen Amos shied away from the notion that air power alone can win wars, however;

'OIF has brought everyone to the ground truth – air power is an enormous force multiplier, but it cannot take and hold ground.

'At the end of the day, Marine Air exists to support the Marine on the ground. We feel very good about our air-ground team. My job was to destroy every piece of equipment the Al Nida Division had before it could be used against my good friend Gen Mattis and his Marines of 1st Marine Division, and that is exactly what we did.'

Thirteen of the 24 AV-8Bs embarked in the 'Harrier Carrier' *Bataan* are visible in this aerial view of the ship taken on 24 April 2003. Harrier II pilots flying from the vessel dropped more than 122 tons of ordnance – primarily laser-guided 500- and 1000-lb bombs. More than 470 targets were hit during these strikes (*US Navy*)

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OIF II/III

After the end of OIF I, Marine Corps units transitioned from combat to peacekeeping activities. By the summer of 2003 all Harrier IIs had left Iraq, as there was a general perception that fighter aircraft were not needed for the rebuilding and peacekeeping roles planned for the war-weary country. Elements of I MEF were gradually withdrawn as other Coalition units arrived in Iraq. By late September 2003 most Marines were back to the USA, or on their way home.

However, widespread looting in many cities and towns plagued Iraq, and following the collapse of government authority factional violence erupted. Virtual anarchy and civil disorder throughout the country dictated the presence of a significant military force to stabilise the situation until a new Iraqi police force and army could be trained up. By the end of 2003, more than 120,000 soldiers from the US Army, 12,000 British troops and 13,000 servicemen from Poland, The Netherlands, Italy, Spain, Ukraine and 25 other nations had been sent to Iraq to keep the peace.

As Coalition forces literally garrisoned Iraq, a violent insurgency began to develop. With the expectation of an American assault, Saddam Hussein had ordered the distribution of arms, ammunition, funds and trained militia forces to all of the major population centres in Iraq so that the war could continue as a guerrilla-type campaign long after he had been removed from power. Insurgent operations gradually expanded (supported by infiltrating al-Qaeda terrorist cells from neighbouring countries), with attacks concentrating firstly in central Iraq and later expanding to the south and north of the country. These attacks disrupted efforts to restore normal services such as electricity, water and sewage, which in turn quickly eroded popular support for Coalition efforts at nation rebuilding.

In March 2004 I MEF Force, consisting of two Marine Corps regiments totalling 24,000 troops, returned to western Iraq to take over operations in the country from the US Army's 82nd Airborne Division, which had remained in the country after OIF I trying to keep the peace. The Marine Corps was given the job of patrolling the porous Iraq-Syria border in the west and the Sunni triangle, which included the city of Fallujah. The Marines found operations in western Iraq very challenging, and they were involved in many serious firefights with insurgents.

Following the Marine Corps air-ground task force concept, I MEF's deployment included 3rd MAW (Forward), organised under MAG-16 control, which included 130 helicopters and transport aircraft – CH-46, CH-53 and UH-1 transport and AH-1W attack helicopters and C-130 transport aircraft – to support Marine operations.

On 31 March 2004, four American contractors were killed and their bodies mutilated in Fallujah. Operation *Valiant Resolve*, led by Marines from I MEF, began four days later with the surrounding of Fallujah. Following a week-long campaign, more than a third of the city had been captured and heavy casualties inflicted on the insurgency. Air support was provided by AH-1W Cobra attack helicopters, USAF AC-130

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gunships operating at night and USAF F-16s dropping JDAM precision-guided munitions.

However, by 1 May combat in the city had been halted due to concerns raised by the interim Iraqi government about the level of destruction and civilian deaths in Fallujah – the world's media also highlighted these concerns. The 1100-strong Fallujah Brigade, led by former Iraqi Army Maj Gen Muhammed Latif and armed with US weapons, was sent in to calm the situation down. Although this initially seemed to work, eventually the Fallujah Brigade was dissolved and all of its weapons had been handed over to the insurgency by September.

US forces had suffered 27 fatalities during *Valiant Resolve*, which was perceived to have been a failure due to political interference from within Iraq and abroad. Over the next several months, Fallujah grew into an insurgent stronghold from which many attacks were regularly launched. By late 2004, many civilians had left the city of 300,000, allowing insurgents to fortify their positions.

As insurgent operations intensified, testing the capabilities of Cobra attack helicopters, Marine Corps commanders called for increased air support. MAG-13 was duly ordered to supply Harrier IIs to augment 3rd MAW, under MAG-16 control. The VMA-542 was one of the squadrons that received the call to deploy, despite the unit having already supplied six jets to 22nd MEU-SOC's HMM-266 for *Wasp's* operational deployment with Fifth Fleet. Arriving off the coast of Pakistan in April 2004, the carrier had sent all six Harrier IIs ashore to Kandahar, in Afghanistan, to support Taskforce *Linebacker*.

Back at MCAS Cherry Point, VMA-542's CO, Lt Col Chester Arnold, and his XO, Lt Col Russell Sanborn, readied the 'Tigers' for war once again after receiving orders on 1 May 2004 to deploy to Iraq. Within 12 days the unit was ready to depart, USAF and civilian cargo aircraft arriving at MCAS Cherry Point to load groundcrew and support equipment. On 13 May VMA-542 undertook a transatlantic crossing with ten of its AV-8Bs, stopping in Spain and Qatar en route to Al Asad air base, in western Iraq. After flying 8400 miles from MCAS Cherry Point, the Harrier IIs reached their new home on 18 May 2004, followed shortly thereafter by the main body of 185 Marines from VMA-542 and Marine Aviation Logistics Squadron (MALS) 14.

Within days of their arrival the 'Tigers' were joined at Al Asad by ten Harrier IIs from MCAS Yuma-based VMA-214 'Black Sheep', led by Lt Col Mark Everman. Amongst the pilots to deploy with the unit was Capt William Maples, who had flown from Ahmed Al Jaber with VMA-214 during OIF I;

'We left as a ten-aeroplane group from MCAS Yuma and initially flew to MCAS Cherry Point. From there we headed to Spain, then on to Qatar and, finally, Al Asad. I was only in-country for eight weeks as I already had orders for my next posting when I deployed. We reached Iraq just after VMA-542. Al Asad was austere then, and we lived in a tent city that was about a mile-and-a-half from the squadron spaces. We were among the first units deployed there, so there was not a lot of infrastructure on the base at that time. We had a ramp to park the jets on but no shade to protect them from the sun. We had one building for the entire maintenance department, and the pilots hung out there to get out of the sun.

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Lt Col Russell Sanborn, CO of VMA-542, tanks from a KC-130T of VMGR-452 overhead Lake Tharthar on 22 September 2004. Once he had topped off his tanks, Sanborn led his wingman back to Fallujah (*US Marine Corps*)

'It was "bad-guy" land, so there were frequent rocket and occasional mortar attacks from outside the base. From takeoff to landing we were flying in an area with an existing MANPADS [Man-portable air-defence systems] threat, so we had to develop tactics to help defeat the SAMs. At that time Al Asad was home to the two Harrier II units, a C-130 squadron and numerous helicopter units, and in August VMFA(AW)-242 flew in with 12 F/A-18Ds, so the air base was busy. We were under 3rd MAW control, assigned to MAG-16.

'Most of our sorties were undertaken by two-jet sections. We flew a mix of airborne CAS, convoy escort and ISR. It was during our deployment that the improvised explosive device [IED] really became the insurgents' weapon of choice. We relied on the Litening pod to not only seek out guys planting them, but also to detect disturbances in the ground and alongside roads where there had been recent activity – this was a telltale sign that an IED had been buried there.

'The emphasis was on supporting the Marines on the ground in Fallujah and Ramadi. We worked with FACs on a daily basis, and we had Litening pods with ROVER capability. We were not carrying GBU-16s during this period due to the collateral damage issues associated with the large 1000-lb bomb. Our primary weapons were the smaller 500-lb GBU-12 and the Laser Maverick, and we also used the Harrier II's GAU-12 25 mm cannon a lot.

'The ROE was not so restrictive in 2004, which meant that we could descend to lower altitudes in order to employ the gun with clinical accuracy. The GAU-12 is a very accurate weapon that offers low collateral risk. And at lower altitudes you can positively ID potential targets far more easily. When making a strafing run, we would use a 20-degree dive at night and 10- to 30-degree dives during daylight hours. Our squadron had standard gun attack profile charts that we would frequently refer to. The risk of fratricide and collateral damage was considerably smaller with the cannon when used at the correct altitude. And once you hung the guns on the jets and worked through both maintenance and pilot training, it proved to be a reliable system. In fact the GAU-12 became a weapon of choice for the FACs during OIF II.

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'We never discounted the MANPADS threat, so we always carried a full load of expendables, both chaff and flares, and they were a "Go – No Go" item for flight.

'3rd MAW wanted 24-hour coverage for I MEF in the field, so VMA-542 sent ten jets and so did we. VMA-214 operated on the day shift and VMA-542 took the night shift whilst I was there in 2004. Although we worked out of the same areas for administration and maintenance, the two units operated independently of one another. Indeed, we had all of our own maintenance equipment, as did VMA-542. Lt Col Everman developed the flight and support schedules for VMA-214, while Lt Col Sanborn did the same for VMA-542. We were on opposite mission cycles, so we did not see much of the other unit. However, there was cross-pollination of tactics and techniques for mission planning and weapons employment.'

Lt Col Sanborn's wingman also takes on fuel from a VMGR-452 KC-130T on 22 September 2004 over Lake Tharthar. Most Al Asad-based Harrier IIs were fitted with the General Electric GAU-12U Equalizer 25 mm five-barrel Gatling gun, and its 300-round magazine, in the twin underfuselage pods (*US Marine Corps*)

When the Harrier II units arrived at Al Asad in May 2004 the former IrAF fighter base was in poor shape. Its runways and taxiways had been cratered by Coalition bombs during OIF I, as Al Asad was the second largest military airfield in Iraq. Included in its vast infrastructure were numerous Soviet-style concrete bunkers and hardstands. The base was also littered with the carcasses of ex-IrAF fighters.

In a press release issued by 3rd MAW shortly after VMA-542 arrived at Al Asad, Harrier II pilot Capt Christian Rizzo stated;

'It was a hastily arranged deployment, with everything happening very quickly. We were very prepared for this, however, having trained hard prior to leaving MCAS Cherry Point. Everyone did a good job getting themselves and the squadron ready to go. I don't think our families were pleased to see us go, but we know this is what we signed up for and what our job is. They understand that our fellow Marines are over here, and that we need to come and help them. In the Marine Air community, we focus on being "air-to-mud" warriors by supporting the troops on the ground. When you get the Marine on the ground and the Marine in the air working together, it is absolutely devastating to the enemy.'

Capt Philip Kendro was one of the pilots assigned to VMA-214 for its OIF II deployment, and he too was quoted in a 3rd MAW press release in mid June;

'We have great targeting capability from a distance, day and night. The enemy does not like fast movers, as they know we will rain metal down on them. We can make the enemy flee by our presence alone, or, if we need to, by dropping bombs'.

Combat operations in OIF II were rather different to those flown in OIF I. The missions were much shorter as Al Asad was considerably closer to the action than the 'Harrier Carriers' had been in OIF I. There was also no moving battle line, thus making the enemy hard to identify – the insurgents went to great lengths to integrate themselves into the general populace.

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USS *Essex* (LHD-2) is seen underway in the NAG on 9 September 2004, the vessel being assigned to Fifth Fleet to support CENTCOM operations in Iraq. At this time the carrier had 31st MEU-SOC/HMM-265 embarked, the latter including six Harrier IIs from VMA-211 Detachment A. These aircraft went ashore to Al Asad shortly after this photograph was taken, 'Det A' becoming part of a 22-strong Harrier II force commanded by Lt Col Russell Sanborn (*US Navy*)

Harrier II pilots flew a variety of missions ranging from armed reconnaissance and convoy escort to CAS. When tasked with performing convoy escort, AV-8B pilots would typically provide 'high cover' for vehicles snaking across Al Anbar Province at night – the Harrier II's distinctive engine noise provided a deterrent to attacks on the convoys. Reaction to the insurgents' hit-and-run attacks, or locating the point of origin of a rocket or mortar attack, proved a challenge throughout OIF II-VI. The Harrier II's Litening II pod was a valuable asset when undertaking such missions.

In August 2004 it came time for VMA-214 to rotate home, and in a 3rd MAW press release to mark the occasion, 'Black Sheep' CO Lt Col Everman remarked;

'The squadron's mission was to provide fixed-wing CAS, precision targeting capabilities, aerial reconnaissance and escorts for helicopters and convoys. We have accomplished our mission thanks to personnel adapting to fulfil the roles required of them – roles that have significantly changed since VMA-214 supported OIF in 2003. Overall, the deployment has gone well. Although we didn't expend as much ordnance as we did the first time we were here, we've contributed in other ways besides dropping bombs because we aren't at war with the Iraqi people.

'Our presence has given the Marines on the ground a boost of confidence. We can provide reconnaissance for convoys by scanning areas ahead and letting them know what to expect. It's great to know our presence had helped some Marines in constant fighting get some sleep at night. Sometimes, we might do a show of force, which can be enough to disband whatever is happening. We make sure they know we are here. The Marines have been spectacular. Out here in the heat, they have risen to every occasion and have met the challenges. We knew we were going to fill in here until relieved, the next MEU is on the horizon for us and we are preparing for future contingencies.'

VMA-542, however, remained at Al Asad, with Lt Col Sanborn (who had become CO in June 2004) overseeing two unit reinforcements. The first of these took the form of the six-aeroplane detachment from VMA-214 that was assigned to 11th MEU-SOC, which came ashore to Al Asad from USS *Belleau Wood* (LHA-3) in September 2004 with the rest of HMM-166. The second unit reinforcement occurred the following month when six aircraft from VMA-211, which had been the Harrier II detachment of 31st MEU-SOC embarked in *Essex* with HMM-265, joined VMA-542. This last merger made Lt Col Sanborn the leader of a 22-aeroplane Harrier II force supported by more than 350 Marines from three different squadrons from two coasts.

VMA-542 REIN (reinforced) would play a key role in Operation *Phantom Fury* or *Al Fajr* – an eight-day combined US Marine Corps/US Army/Iraqi Army offensive that saw 13,350 troops charged with ridding Fallujah of around 4000 insurgents. The 'Tigers' had been due to rotate back to MCAS Cherry Point in October, but Lt Col Sanborn received permission from CENTCOM for the unit to remain at Al Asad in order to support the start of *Al Fajr*, on 8 November.

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Aside from the Harrier IIs, the Coalition assault force received air support from F/A-18Ds, F-16CJs and AC-130Hs, plus Marine Corps and US Army artillery. Some 24 sorties were flown over the city on the first day of the assault, and four Mk 82 500-lb bombs were dropped. The fighting continued until December, when the city was overrun and insurgents forced out after suffering heavy casualties. About 80 per cent of the fixed-wing CAS sorties flown in support of *Al Fajr* were performed by 3rd MAW aircraft. By the end of the operation, 319 precision-guided munitions, 391 missiles and rockets and 93,000 cannon and machine gun rounds had been 'sent down range' by aircraft operating over Fallujah, and there were no casualties due to friendly fire.

A section of Harrier IIs from VMA-214 'Det A' adopt a line astern formation for the benefit of the USAF photographer aboard a KC-10 operating over Iraq in October 2004. The AV-8B+ is armed with a GBU-12 LGB and the Night Attack Harrier II carries a 'LMAV'. Both jets have cannon pods (*USAF*)

The absence of any 'blue-on-blue' incidents was due to the Marine Corps officers who planned the CAS system – dubbed as 'keyhole CAS' – employed against the insurgency in Fallujah. Designed to be workable and efficient, and ultimately proving to be resoundingly successful, 'keyhole CAS' integrated the high volume of CAS assets available into the intense and fluid urban combat environment encountered by Marines on the ground in the narrow streets and alleyways of Fallujah. It was a fast-paced and effective command-and-control system. Pilots had to be ready to prosecute their target when called, or they would be 'kicked out' of the airspace over Fallujah.

VMA-542 delivered some of the first bombs dropped in *Al Fajr*, resulting in direct hits on high value targets. In total, the unit delivered more than ten tons of ordnance, 220 rounds of 25 mm ammunition and flew 300+ combat hours during the eight-day evolution in Fallujah.

Capt Ryan Hough, a Harrier II pilot with VMA-542, was quoted in a 3rd MAW press release issued during *Al Fajr*;

'You have to always keep your guard up during these sorties, because in an instant the troops can be in contact with the enemy and need immediate attack. As a single-seat pilot in the Harrier II, you are always juggling multiple tasks such as navigation and the Litening II pod at the same time, and you are expected to do all of these things perfectly.

'We have flown over the skies of Iraq for six months now, and in that time we have fulfilled joint tactical air requests for every kind of ground unit. The tasks have varied, including convoy escort at night, supporting recon teams during raids and providing on-call CAS for the troops on the ground. Even though there were many sorties where no ordnance was expended, we still used our Litening II pods for reconnaissance. Operations around Fallujah have been particularly challenging because of the congested airspace. You have to be able to find the specific target in the urban environment, close to Marines engaging the enemy, within the short time you are allotted so as not to interfere with attacks being made by other aircraft that are sharing the limited airspace over the city with you.

'We have been able to maintain a near-constant presence over Fallujah for more than a week thanks to the hard work and dedication of our

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Two AV-8Bs from VMA-214 'Det A' hold station off the left wingtip of a USAF KC-10 prior to conducting a twilight aerial refuelling evolution on 3 October 2004. The 'Black Sheep' deployed six Harrier IIs to Al Asad from USS *Belleau Wood* (LHA-3) in September 2004, the aircraft remaining in theatre until February 2005. They were heavily committed to operations over Fallujah during this period (*USAF*)

maintenance Marines. They have worked tirelessly, seven days a week, twelve hours a day, for six months.'

Fellow Harrier II pilot Capt Charles DelPizzo noted in the same press release;

'We spend lots of time mission planning and tracking friendly movements so as to avoid any potential collateral damage issues arising from the targets we attack. We fly with the same maps that the FACs have in their hands so that we can easily be talked onto a target using landmarks. It is imperative that the pilots know all they can about the fight on the ground. There are also many restrictions that we have to be aware of, including closed airspace, other aircraft, no-fire areas, potential for collateral damage and limited communications between air and ground assets.

'If the FAC is having trouble talking to Division HQ, we may not get approval to strike a particular target. The pilots that are here have trained for many years for this very eventuality back home, so we usually do well here in Iraq. We have a digital [CAS] page that allows us to enter data into our system without writing it down. The aircraft then tells you things like time and speed required to be on target, graphically depicts your route on the moving map, designates the target in the head-up display, and even shows where "friendlies" are located in relation to the designation. All of this is particularly helpful when conducting nocturnal missions, as it allows the pilot to develop a night mindset that in turn makes providing CAS "after dark" a lot easier.'

When VMA-542 finally departed Al Asad in mid November, its place as the parent Harrier II unit in-theatre was taken by VMA-311, led by Lt Col Clyde Woltman;

'My squadron had originally been tasked to go to OEF, and we were training to perform that mission during work-ups at MCAS Yuma for much of 2004. Soon after I took over command I did a pre-deployment site survey to Afghanistan, but within days of my return Maj Gen Keith Stalder [CO of 3rd MAW] told me, "Clyde, you are not going to Afghanistan. You are going to Iraq". We hit the reset button, packed up the squadron and I headed to Al Asad in advance of my unit. The reason I went early was that the General was concerned about how things were being coordinated between the fixed-wing assets on base, and he wanted me to do an assessment for him. At that time, VMA-542 was based there, along with the detachments from VMA-211 and VMA-214 that had recently shown up. The General asked me my opinion of how we should employ all the Harriers. It was pretty simple in my view – put them all in one site under one commander.

'My troops and ten aircraft showed up to replace VMA-542 a few weeks later, and we too worked with the VMA-211 and VMA-214 detachments. I left six jets and some personnel back at MCAS Yuma under the command of Maj John Kane, who was in charge of training them up in preparation for a six-month deployment to MAG-12 at MCAS Iwakuni, Japan, in

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May 2005. Assigned to HMM-262 and 31st MEU-SOC once deployed, Maj Kane and his detachment relied on VMA-513 for additional support at Yuma prior to heading to Japan.

'At Al Asad we combined the pilots, and their procedures, from all three units in-theatre. I acted as overall CO and we made VMA-311 into a "super squadron". Once we kicked off operations things ran pretty smoothly from the start, as we were all Harrier guys from the same group [MAG-13] and we all shared common procedures.

In November 2004 VMA-311 arrived at Al Asad to replace VMA-542. This particular aircraft from the unit, photographed returning from a mission on 7 January 2005, is armed with a GBU-12 and an AGM-65E Laser Maverick. It would almost certainly have been paired up with a Litening II-equipped Harrier II on this sortie (*Col Clyde Woltman*)

'The actual integration of the detachments was immediate and efficient. While in garrison back at MCAS Yuma, we had established working relationships with each other and had been following the same policies, directives and standard operating procedures. I placed much of the responsibility for the integration of the three units on the shoulders of the non-commissioned officers in-theatre. In typical fashion, they made it happen. The strength of the Marine Corps is its ability to "task organise". We did just that. The unit was larger than normal, but then so were our operational demands. We also relied heavily on the support team from MALS-14, which had been at Al Asad helping to maintain the AV-8Bs since May.

'VMA-311 arrived at Al Asad on the eve of *Al Fajr*. Although we supported the whole area of operation in the Sunni triangle, we primarily worked over Fallujah – indeed, the only other aircraft I recall seeing over the city during *Al Fajr* at that time were Marine Corps Harriers and Hornets.

'Upon taking off from Al Asad we would talk with our initial controller, who told us where we were needed most. En route to that location, we would talk with a FAC on the ground that was assigned to troops engaging the bad guys. There were coordination issues we needed to follow for "keyhole CAS" during *Al Fajr*, and we made sure that we stayed in our area – straying into airspace assigned to UAVs or other TACAIR could have resulted in midair collisions. Things got very busy in the cockpit during "keyhole CAS" – you were effectively "juggling balls in a windstorm". We quickly came to realise how beneficial the Litening pod was in these situations.

'Here we had a dense urban environment with Marines on the ground that had direct, face-to-face contact with the enemy. I was flying overwatch for the troops, looking down from 15,000-18,000 ft at Marines on the ground, communicating with them and using our sensors to confirm whether the contact he was seeing was a good guy or a bad guy. If it was the latter, I would immediately pass this information on to my FAC, who would in turn ask me to drop a bomb on that location within 90 seconds. The cooperation between troops on the ground and Marine Air during "keyhole CAS" in *Al Fajr* was just a beautiful thing to be involved in.

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An air strike by Harrier IIs is called in on a suspected insurgent hideout on the outskirts of Fallujah by US Marines assigned to K Company, 3rd battalion, 5th Marine Regiment, 1st Marine Division, during the opening hours of Operation *Phantom Fury* on 8 November 2004 (*US Marine Corps*)

'As a TACAIR guy, I was used to having a lot of things going on at one time. You needed to be constantly monitoring airspeed and location so that you did not stray into another pilot's airspace – there were numerous other aircraft over Fallujah at higher and lower altitudes, and we did not want to interfere with their missions.

'You were required to provide constant overwatch while on station over the city, and my wingman and I often had to "yo-yo" between FACs during a mission. I might work with one FAC and have my wingman work with another one, or we would both work with the same FAC and "buddy lase" our LGBs – when working with the same FAC we would separate our two aircraft by altitude, thus reducing the chance of a midair collision. Sometimes I would head to the tanker, which was 40-50 miles away, while my wingman remained in overwatch mode with the same FAC until I came back to relieve him, at which point he would go and get gas. This way we remained in constant oversight with the troops we were supporting, for once you had developed good situational awareness of what was going on in the battle, what you do not want to do was both go away and lose it. Ideally, you wanted to remain on overwatch until all your ordnance was exhausted, at which point you had to be relieved.

'We were there to support the Marines on the ground in *Al Fajr*, as when they needed someone to be killed, they needed it done immediately, not later on. That formula worked well for us.

'I cannot overstate how valuable the Litening pod was to us throughout the deployment – we used our radar a bit too. With the pod you could see everything on the ground, even at 0200 hrs. The only complaint we had centred on the display screens in the cockpit. As in OIF I the year before, we still had the green raster scan displays in the jets, and they were not as good as they could have been when it came to viewing pod footage. At mission end we would fly back home and look at the tapes on a TV in the ready room, at which point pilots were routinely heard to say, "Damn, I did not see that on my screen".

'There were also a limited number of ROVER-equipped FACs in the field with ground forces, and they too proved to be a big help. All Marine FACs are pilots, and they could also see what you could see thanks to the ROVER link. Sharing a common Marine Air background, FACs and Harrier II pilots effectively spoke the same language when it came to locating, identifying and destroying targets. Although ROVER was still a new system in late 2004, and had only been issued to a handful of FACs, it had a positive impact on "keyhole CAS" missions in *Al Fajr*, nevertheless.

'During the Fallujah operation VMA-311 primarily used GBU-12s and -16s, AGM-65 Laser Mavericks and the 25 mm cannon. The "LMAV" proved to be a solid weapon in urban CAS, the FAC picking out the target with his handheld laser designator and the seeker head in the missile detecting the laser spot. At this point the pilot fired the weapon, which could usually be relied on to hit the target precisely where the pilot and the FAC wanted it to.'

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OIF IV

As previously noted, following the successful conclusion of OIF I in April 2003, the US government had hoped for a relatively short multi-national occupation followed by a rapid turnover to the Iraqi government. However, insurgent operations systematically increased throughout 2004 and into 2005 across Iraq. Armed forces from more than 20 nations duly sent troops to both support security and train up the Iraqi Army and police force. CENTCOM assigned the security of the particularly troublesome Al Anbar Province, in western Iraq, to the Marine Corps through to 2006. Having struggled to contain the growing insurgency in this area from February 2004, 1st Marine Division was determined to create an environment for a successful 30 January 2005 Iraqi election where, for the first time, citizens went to the polls to elect a representative government.

Most of MAG-16's fixed-wing TACAIR units that were tasked with supporting 1st Marine Division operations were based at Al Asad. The large ex-IrAF base, formerly known as Qadisiyah, was situated 112 miles west of Baghdad. Boasting two long runways and more than 30 large concrete aircraft shelters, it had been built by Yugoslavian contractors in the 1980s. In January 2005 the base was the home to ten Harrier IIs from VMA-311 and two six-aeroplane detachments from VMA-214 and VMA-211. A single F/A-18D squadron (VMFA(AW)-242 was in the process of being relieved by VMFA(AW)-224) and large numbers of Marine Corps helicopters and transports also called Al Asad home.

Since arriving in-theatre in early November 2004, VMA-311 had flown 24 hours a day, seven days a week. This exhausting operational tempo had seen the unit rack up more than 3000 flying hours in just three months, thereby setting a record for the Harrier II.

Al Asad was one of the biggest air bases in Iraq, with a perimeter fence that ran for more than 23 kilometres. Highly vulnerable to insurgent attacks, the airfield relied on dedicated Marine Corps security personnel to ensure that the base was protected at all times. These M1A1 Abrams stopped by one of the numerous dispersal areas scattered across Al Asad during a perimeter patrol on 28 February 2005. The two AV-8B+s parked inside the covered revetment belonged to VMA-311, while the F/A-18D in the foreground was assigned to VMFA(AW)-242 (*Capt Matt Merrill*)

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A plane captain guides a VMA-311 jet back in at Al Asad after a successful air support mission for Coalition forces in Iraq on 27 February 2005 (*US Marine Corps*)

Having overseen a relatively trouble-free Iraqi election, the two Harrier II MEU detachments returned to their ships and VMA-311 continued operations from Al Asad alone. 'It was sad to see the detachments leave, but their time was up', recalled VMA-311 CO Lt Col Clyde Woltman. 'They had performed admirably. Upon their departure our operational tempo dropped proportionally, although we continued "business as usual"'.

In February Marine Corps and Iraqi Army forces initiated Operation *River Blitz* throughout Al Anbar Province, with a special focus on the city of Ramadi, in central Iraq. 'We have been asked by the Iraqi government to increase our security operations in the city', stated Maj Gen Richard F Natonski, Commanding General, 1st Marine Division, at the time. 'Our job is to locate, isolate and defend against anti-Iraqi forces and terrorists, who are intent on preventing a peaceful transition of power between the interim Iraqi government and the Iraqi Transitional Government.'

Lt Col John Kane, formerly XO of VMA-311 and now operations officer for the Aviation Combat Element (ACE) of 3rd MAW, was tasked with supplying TACAIR assets for *River Blitz*;

'We choose which missions to fly based on availability of aircraft and mission priority. We always have more requests than aircraft. It is a challenge to fulfil all of the requests, but we ensure we do not put anyone into a bind. The AV-8Bs of VMA-311 have had to carry the load while the F/A-18D squadrons swap out. The "Tomcats" have picked up the slack and done a phenomenal job. The ACE provides flexibility of movement with the element of surprise. Marine aviation boasts the most lethal firepower the MAGTF has in its arsenal. The coordination between the ACE and the ground combat element has been the key to the success of this operation.

'During *River Blitz*, the ACE completed 190 sorties totalling 300 flying hours in support of the ground offensive that saw the capture of 215 suspected insurgents, 50 rifles and 300 mortar rounds'.

On 1 March 3rd MAW ended its 13-month deployment to Iraq, with the responsibility for air operations being handed over to 2nd MAW (Forward), led by Brig Gen Robert Milstead. MAG-16 also left Iraq, its place being taken by MAG-26. On 3 March Lt Col Clyde Woltman turned over command of VMA-311 to Lt Col Robert Kuckuk at Al Asad.

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'When I took over the squadron, command rotations were such that I knew the commanding general of 2nd MAW, the CO of MAG-26 and the CO of the Hornet squadron based at Al Asad, so the command relationships were very good from the start', Lt Col Kuckuk explained. 'Much of the flying in March and April was over Ramadi, and we got to know the city, our ground forces and our adversaries very well from flying, looking down and talking to our friends on the radios. We ran convoy escorts and provided support with our targeting pods. We knew that the insurgent strong points that fed the action in Ramadi and provided supplies were out to the west of the city, so when Operation *River Bend* started we were excited about targeting some of the sources of the problems along the Syrian-Iraq border. The operation kicked off at the end of April 2005, and we supported *River Bend* until we left in May'.

An AV-8B from VMA-513 'Det A', assigned to 15th MEU-SOC/HMM-165, lands on LHD-6 just prior to the aircraft being sent ashore to Al Asad in March 2005. 'Det A' remained shore-based until May, having supported Operation *River Bend* (targeting problem areas along the Syrian-Iraq border) throughout its time in Iraq (*US Navy*)

Aircraft from VMA-311 flew alongside six Harrier IIs from VMA-513 Detachment A throughout *River Bend*, the latter unit having flown ashore to Al Asad from *Bonhomme Richard* on 11 March as part of 15th MEU-SOC/HMM-165. 'We are glad to be here', stated Maj Shawn Steranduerg, CO of 'Det A', in a 2nd MAW press release from 8 April 2005. 'It is good for tactical aircraft to get off the ship. Since we have been here our flying hours have tripled. We are also doing a real-world mission in Iraq. Every one of us would stay if we had the opportunity'. While the AV-8Bs and helicopters of 15th MEU-SOC operated from Al Asad, its Marines performed security operations in Baghdad. In mid May, after two months of high tempo operations, both the air and ground units returned to the *Bonhomme Richard* amphibious task group.

Six weeks earlier, at the end of March, II MEF (including 2nd Marine Division, with two RCTs) led by Maj Gen Stephen Johnson, had assumed command of all Marine Corps assets and personnel in Iraq with the departure of I MEF. Security operations in Al Anbar Province continued under the new leadership, with II MEF's campaign strategy focusing on working five simultaneous objectives – (1) expand and (2) train Iraqi security forces, support (3) emerging governance and boost (4) economic development and (5) influence.

In May 2005, after serving a six-month tour, the 200 Marines and ten aircraft of VMA-311 returned home to MCAS Yuma. 'We have flown three times our normal amount since arriving here', explained Maj Rob Schroder, VMA-311's operations officer, in a 2nd MAW press release dated 16 May 2005. 'In November we hardly saw any lights on the ground, then gradually the cities began to get power and we could see lights multiplying as we spent more time over them. It is a testament to what we are doing here. With our assistance, the troops on the ground have been able to keep the cities secure so that Iraqi engineers could restore power to large parts of the country. More cities lit bore testament to the fruits of our labour in-theatre.

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'VMA-311 has flown more than 3400 sorties totalling 6200 flying hours. We have shown the Marine Air community that, given proper maintenance and supplies, our aircraft can perform extremely well.'

Maj Schroder's CO, Lt Col Robert Kuckuk, added in the same press release;

'We have worked 12-hour days since we started here. We are proof that working in an austere environment with no breaks, through all the holidays, Marines can still keep a fast tempo. Once we got in the groove and hit our "battle rhythm", we kept operating at a high tempo for an extended period of time. Tasks that could take up to two weeks at Yuma took a couple of days out here. It was because all of our Marines worked together really well and came together to get our birds ready for their next mission.

'Once at Al Asad the pilots had to become accustomed to flying most of their mission under the cover of darkness. Back at Yuma, pilots spend about 10-20 per cent of their overall flight time at night. Since being here the "Tomcat" pilots have flown upwards of 70 per cent of their overall flight time in darkness. Flying at night is different than flying in the day. I have guys who have flown 80 per cent of their sorties at night. It's not unusual for some of our pilots to go weeks without seeing sunlight. This is a 24-hour war.'

By early 2005 the intense pace of operations in Afghanistan and Iraq was significantly impacting Marine Corps ground and aviation forces, and senior officers realised that they had to plan for a long war on two fronts. Due to the heightened operational tempo, many Marine Air units were utilising the flying hours on their aircraft at more than twice normal peacetime rates. For example, the normal flying hours per month planned for an AV-8B at this time was 23.2 hours, but aircraft operating from Al Asad were racking up an average of 59.2 hours per month.

In order to give frontline AV-8B and F/A-18D units a chance to rest crews and preserve their airframes, reserve-manned VMFA-142, flying F/A-18A+s, joined VMFA(AW)-224 at Al Asad in February 2005 to provide combat support for ongoing operations in Al Anbar Province. All Marine TACAIR jets in-theatre now had enhanced Litening II pods fitted as standard, this system being able to direct-feed raw video to FAC ROVER terminals and 'C3I' systems. Aside from their primary missions of armed reconnaissance, convoy escort and CAS, Harrier IIs and Hornets were also routinely given the job of ISR overwatch. Finally, units frequently performed 'show-of-force' low-level, high-speed flybys to intimidate insurgents or deliver ordnance as required.

Following a three-month break in OIF Harrier II operations, VMA-223 and 150 Marines arrived from MCAS Cherry Point on 26 August 2005, allowing VMFA-142 to return home to NAS Atlanta, Georgia. VMA-223's XO, Lt Col David Lancaster, remarked in a 2nd MAW press release;

'Our main job is to support the Marines on the ground in any way we can. Being one of the air wing's reconnaissance assets provides us with a great challenge, and one that we are ready to take on. Whether it be providing surveillance support or just showing our presence, we are a valuable asset to the ground Marines and a deterrent to insurgent activity. This is not the first time the "Bulldogs" have deployed in support of OIF. In 2003, we flew combat operations from the amphibious assault ship *Bataan*. We have a lot of Marines still in the squadron who served with us two years ago.'

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An AV-8B Night Attack aircraft from VMA-211 Detachment A, assigned to 13th MEU-SOC/HMM-163, takes off from *Tarawa* on 9 September 2005 while the ship was operating in the Red Sea on its way to the NAG (*US Navy*)

A month later VMA-211 Detachment A reinforced VMA-223 when its six Harrier IIs flew in from *Tarawa* as part of 13th MEU-SOC/HMM-163. Capt Jeremy Gettings was one of the pilots assigned to 'Det A';

'Flying off the boat and into Al Asad presented us with very few problems, as Iraq was a benign environment to fly in. Our detachment consisted of four radar-equipped and two Night Attack jets, and upon arriving at the base we were moved to the south side of Al Asad to commence operations with VMA-223. As an MEU detachment, we had all of the people and equipment needed to support our six jets.

'Our first effort was to provide CAS for two Marine battalions during Operation *Steel Curtain* in early November. Our mission was to slow the crossing of insurgents along the Iraq-Syrian border. During almost every sortie throughout the operation we relied on tanker support – predominantly KC-130s, but sometimes USAF KC-135s and KC-10s. If CAS was not needed at the time, the FAC would give us an area to look at for IEDs. The FLIR in the Litening II pod was great for this, as we could sense where the ground had been disturbed at night due to temperature differential. We would send possible IED locations back to the FAC. He would then plot this information on a map, and it would eventually be checked out by a ground patrol.

'Our standard load-out was two external fuel tanks, a GBU-12, the 25 mm cannon pod and the Litening II targeting pod, which was usually carried by the lead aircraft. The second jet would carry the same load, except a Laser Maverick missile would replace the GBU-12. The "LMAV" was just as accurate as a GBU-12, but had a smaller warhead that meant its employment posed a reduced collateral damage risk. The most unique thing about our weaponry fit on that deployment was the fact that we carried live AIM-9s for a time when flying along the border with Syria. This was because we had received intelligence reports stating that hijacked airliners could possibly be sent to attack our bases from within Syria. We had flown a lot of air-to-air training missions during our pre-cruise work-ups, and also participated in some aerial exercises with Egyptian Air Force and USAF fighter units in Operation *Bright Star* over Egypt before reaching the NAG and flying off into Iraq. This meant that we were well prepared for aerial combat.'

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This VMA-211 'Det A' jet was photographed high over Ramadi on 9 December 2005. The unit's Harrier IIs were heavily committed to Operation *Steel Curtain*, which saw Marine Corps and Coalition forces working hard to prevent insurgents gaining access to Iraq from Syria (*Maj Jeremy Gettings*)

The Marine Corps continued to undertake security operations in Iraq, with an increased focus on the training of a new Iraqi Army and police force that CENTCOM hoped would eventually quash the insurgency. Losses among locally manned units charged with enforcing the law were heavy during this period due to increased efforts by Sunni insurgents to target both the Iraqi Army and police force. In early November 2005, RCT-2 ran Operation *Steel Curtain* along the Iraqi-Syrian border. Although progress was being made in the war against the insurgency by operations such as this, it was a 'hard sell' to the world's media, especially as Coalition casualties were so high – no fewer than 500 Marines were killed and many more wounded in the 2004-05 campaigns due to ambushes, rocket and mortar attacks and IEDs. The losses suffered by the civilian population in Iraq were appreciably higher still.

Several weeks prior to *Steel Curtain*, on 15 October 2005, the Marine Corps had worked hard to create a positive climate for the Constitutional Referendum. Two months later, on 15 December, II MEF provided security for the Iraqi national elections. Harrier IIs were kept busy on both occasions.

Shortly after the national elections 22nd MEU-SOC arrived at Al Asad, VMA-223's Detachment A (part of HMM-261) flying in from *Nassau*. This was the only time during OIF when an entire Harrier II unit was based at Al Asad, VMA-223 having no fewer than 16 AV-8Bs in Iraq. Both 'Det A' and the parent squadron would remain in-theatre until March 2006. By then the 'Bulldogs' had flown more than 1700 sorties, totalling in excess of 4700 flying hours and delivered some 14.5 tons of precision-guided munitions against targets in Iraq.

In 2006 I MEF began arriving back in Iraq to replace II MEF, thus marking the start of the third large-scale Marine Corps deployment to Iraq since OIF I in 2003. This rotation included both air and ground units – on 8 February 3rd MAW and MAG-16 assumed control of air operations over Al Anbar Province from 2nd MAW and MAG-26. On 28 February I MEF assumed command of all Marine Corps assets and personnel in Iraq.

In February 2006 maintenance personnel from VMA-513 started arriving at Al Asad, and on 7 March ten aircraft flew in from MCAS Yuma. This was the first time the 'Nightmares' had deployed to Iraq in more than detachment strength, the unit having been heavily committed to operations in Afghanistan since 2002. Interviewed by a 3rd MAW PAO on 16 March, Gunnery Sgt Travis White (quality assurance chief for

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VMA-513) explained that 'the main body of the unit arrived prior to the aircraft in order to unpack and have the work centres established. We had to be ready to fix and fly jets from when we set our boots on the ground'.

Unit CO, Lt Col Willis Price, told the same PAO 'we will be doing our best to complete the job assigned to us, and we will give every bit of our effort to meet or exceed the expectations laid upon us. We have Marines on their second and third deployment with us – a few of my Marines have been deployed during both OIF I and II'. He added that VMA-513 planned to stay in Iraq for about seven months, with its main job being to support the Marines on the ground.

The vast expanse of Al Asad air base, seen from an AV-8B flying overhead on 26 June 2006. This facility was heavily utilised by the Marine Corps for seven years following OIF I (*Lt Col Will Price*)

GSgt Christopher Evans remarked, 'Our Marines are more than ready to work on the jets. We have gone through many training evolutions such as *Desert Talon* before we deployed. The Marines are excited about being here. Our job remains virtually unchanged from back home. The only difference is we are not flying with any training ordnance. All the jets go out with live bombs to directly support the ground combat effort'.

In April VMA-513 became the first Harrier II squadron to employ JDAM operationally in Iraq. 'With this new feature on our jets, we will be able the hit targets more accurately, therefore making us a more efficient squadron', explained Lt Col Price in a 3rd MAW press release dated 11 April 2006. VMA-513 pilot Capt Ben Hutchins was also quoted as follows;

'The JDAM is a "fire and forget" weapon. Once the target is identified and the GPS coordinates are entered, the pilot can forget about that target and focus on finding another one. JDAM is not affected by weather conditions or bad communications signals. If the weather was bad with the old system, the pilot might not have been able to find the target and illuminate it with our laser designator. If communications were bad, the ground Marines wouldn't be able to call the pilots in, thereby making it impossible for us to provide them with CAS.'

Aviation ordnance chief MSgt Marc Senecal of VMA-513, added;

'We can load 500- and 1000-lb general purpose bombs fitted with a JDAM tail fin kit to our jets. The kit houses a GPS guidance system, control fins and a receiver antenna. There is also a small strake kit that we add to the front of the bomb to improve its stability in flight. With JDAM, our jets are less reliant on having either another aircraft or a Marine infantryman on the ground mark the targets with various laser designators. The Harrier is now able to pick out the target and employ the munitions needed to destroy it without assistance. The most important aspect of the JDAM system is that it means that the Marine rifleman in contact with enemy forces can count on our bombs being on target. He knows help is only a radio call away.'

The combination of JDAM, the Litening II pod and ROVER made the Harrier II one of the most versatile TACAIR assets in Iraq during 2006, with VMA-513 flying myriad armed reconnaissance missions and

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Ordnance technicians of VMA-513 mount a 500-lb GBU-38 JDAM under the wing of an AV-8B on 2 April 2006. The JDAM is a 'fire and forget' weapon, which means that once the target is identified and the GPS coordinates are entered into the bomb's guidance system, the pilot can forget about the target and focus on finding another one. This weapon is not affected by weather conditions, being guided to the ground coordinates set into the system by INS and GPS. On 11 May 2006 VMA-513 delivered the first GBU-38 strike against insurgent positions (*US Marine Corps*)

frequently being called on to provide CAS. 'Our job is to neutralise the enemy before they can harm our Marines', Maj John Rountree told a PAO from 3rd MAW. 'That's why we exist, and we are proud of that role. And without our ordnance Marines, we would be nothing more than a manned surveillance aircraft'. Capt Guy Berry added, 'The ordnance shop has the difficult job of ensuring that every Harrier that leaves our flightline has serviceable weapons on it – precision-guided bombs and missiles that will work to support the Marines on the ground. Our "ordies" are also in charge of loading and checking the countermeasures that we carry in the jet to protect ourselves from SAMs'.

One of the 'ordies' referred to by Capt Berry was LCpl Nicholas Angular;

'Our main responsibility is putting bombs on the jets so the pilots can put the bombs on the targets. Before any of our birds leave we have to make sure they are carrying the proper munitions. We make sure all of the safety pins have been removed, and we also have to perform voltage checks on Harriers carrying AGM-65 Mavericks to make sure that there are no stray currents running through the aircraft – these could launch a missile accidentally.'

VMA-513 went on to tally 4519 flying hours from Al Asad, with the squadron achieving an impressive 95 per cent sortie completion rate.

The 'Nightmares' had been reinforced from April by VMA-214 Detachment A, although not in the traditional way, as 'Black Sheep' pilot and two-time OIF veteran Maj William Maples explained;

'Lt Col John Ray was CO of the detachment, which consisted of ten pilots, six jets and several dozen maintainers and support staff. We were assigned to HMM-166 ACE, which was in turn part of 11th MEU-SOC embarked in *Peleliu*. Typically for a Harrier det, we took four radar and two Night Attack jets with us. We did the standard port visits and exercises en route to the NAG, and once off Kuwait the entire MEU, including the ACE, was offloaded for sustainment training. Lt Col Ray had arranged for the Harriers to stay on the boat due to a concern about FOD [foreign object damage] at the airfields in Kuwait.

'Several weeks prior to our arrival in-theatre we had sent a pilot ahead of us to coordinate air operations with MAG-16 and get us on the ATO for sorties into Iraq from the ship. We started flying missions in support of the Marine RCTs within days of us reaching the NAG. We took off from the carrier and flew into Iraq, where we met up with USAF tankers and took on fuel, before supporting ground forces. We then did another mid-mission refuelling and flew more missions, before conducting a late mission tanking and flying back to the boat. These were long sorties that typically lasted between six and six-and-a-half hours.

'We always flew in sections of two aircraft, and typically undertook direct support missions for Marine units on the ground in western Iraq. We occasionally flew into Al Asad to refuel and rearm, being looked after there by Lt Col Eric Austin of MAG-16. However, the vast majority

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of our sorties commenced from and ended on *Peleliu*.

'We usually carried two fuel tanks and one GBU-12 on these missions, and all our aircraft were permanently fitted with gun pods. This was a relatively light load for the Harrier II, as the weather was already getting excessively hot and we were concerned about bringing the weight back to the ship – the AV-8B's ability to hover at heavier weights is adversely affected by high temperatures. In these conditions the Night Attack jet had a distinct advantage due to it being lighter than the AV-8B+, thus offering the pilot more of a positive performance margin in the NAG.

Two AV-8Bs from VMA-513 are directed in at Al Asad by LCpl Kyler Buckner after completing a sortie over Iraq on 10 July 2006. Kyler, an ordnance technician with the 'Nightmares', and his fellow 'ordies' would arm every Harrier II before they took off and disarm them when they returned from their mission (*US Marine Corps*)

'Although I had flown quite a few missions during OIF I and II, these were the toughest sorties of the lot. All of the tanker tracks were over Iraq, with the closest one to us being a southern track near Basra – the rest were spread across the country. We tanked in-country on the way back to the carrier and then flew out over the NAG, where there were no tanker assets. Managing fuel in the final stages of what were long missions therefore became critically important.

'Visibility in the NAG could be affected by some weird, and unique, environmental factors. We dubbed the area the "soup bowl" due to the milky, hazy cloud that often blighted the NAG during the spring and summer. Trying to find the ship in the middle of the night in such weather conditions was tough. There were also burning oil platforms that you had to ignore – the light they gave off could easily trick you into thinking you had found the ship. Coming back to the ship at night was always a challenge. You had to be on your game throughout the mission, but especially during a night landing.

'More often than not we brought our ordnance back, as I MEF valued us more as ISR platforms, thanks to our Litening pods and ROVER link, than traditional "bomb trucks". We did, however, get to drop the occasional LGB in response to an on-call CAS request. We performed plenty of show-of-force passes, flying low and fast in order to make as much noise as possible. Convoy support, hunting for IEDs, was another staple mission. We derived great satisfaction from directly supporting Marines on the ground at war during the two months we had *Peleliu* to ourselves whilst the MEU – both the ground element and ACE, bar the Harriers – were training in the Kuwaiti desert. We were the only aircrew in the HMM-166 ACE to get combat time in their logbooks on cruise.'

In September VMA-513 was replaced at Al Asad by VMA-211, which would subsequently remain in-theatre for more than 200 days until March 2007. On 9 November the squadron used JDAM in anger for the first time, XO Lt Col Ossen D'Haiti remarking, 'It was too easy, especially coming from the old way of doing things. To have two different bombs hit two different points of impact at nearly the same time and take out a building is incredible'. WTI Maj Kane Anderson was also involved in this mission;

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An AV-8B Night Attack from VMA-214 Detachment A, assigned to 11th MEU-SOC/HMM-166, commences its takeoff run along the flightdeck of *Peleliu* on 5 May 2006. Uniquely, Harrier IIs from 'Det A' flew operations over Iraq exclusively from LHA-5 for two months while the rest of 11th MEU-SOC/HMM-166 conducted training in Kuwait (*US Marine Corps*)

'We answered a request from 3rd Battalion, 6th Marines, who confirmed that they had known anti-Iraqi forces in a building that they wanted turned into rubble. JDAM has the capability to be dropped in all weather conditions – it can be dropped from above or below the clouds. You can also generate coordinates, which means it does not have to see the target – the Achilles' heel of the laser-guided bomb. The JDAM is more accurate and reliable. You can also programme the angle of impact, which increases the accuracy of the bomb. We are using Block 4 JDAM, which is able to use relative targeting. The aeroplane has new software, which enables relative targeting. In simple terms, this means being able to put the targeting pod cursor onto the aim point and then letting the software transfer coordinates to the JDAM. This is a unique capability that we have just received. Indeed, the Harrier is presently the only aircraft in the naval inventory with this capability, while the F-15E is the only other aeroplane in-theatre with relative targeting at the moment.'

Keeping the Harrier II flying in the oppressive heat of an Iraqi summer was a challenge, as VMA-211 technician Cpl John Ortega recalled. 'The Harriers are the hardest aircraft to work on in the Marine Corps inventory because they have so much power. The resulting airframe vibration can pull some of the wiring loose. You learn something new every day when servicing the Harrier'. Thanks to the efforts of Cpl Ortega and his fellow maintainers, the 'Wake Island Avengers' would ultimately complete some 2700 missions totalling 5200 flying hours.

September 2006 also saw VMA-542 briefly return to the NAG as part of 24th MEU-SOC/HMM-365 embarked in *Iwo Jima*. Like VMA-214 'Det A', the 'Tigers' operated their six jets exclusively from the carrier, flying a number of missions into Iraq (including 42 sorties over Basra in support of British ground forces) before LHD-7 sailed into the Arabian Sea following an upsurge in the fighting in Afghanistan.

In November VMA-311 Detachment A arrived at Al Asad, having flown in from *Boxer* where it was part of 15th MEU-SOC/HMM-165. Maj Peter Blake led the AV-8B detachment;

'The entire ACE went ashore to Al Asad, Lt Col Chris Papaj and HMM-165, with their helicopters, being housed on the north side of the base and our six Harriers joining VMA-211, a KC-130 unit and, towards

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the end of our deployment, USAF A-10s on the south side. We lived and worked in the same area as VMA-211, sharing maintenance spaces and the ready room with the "Avengers". Lt Col Brad Gering was the CO of VMA-211 at the time, and he and his Marines and officers treated us very well.

'While we were still administratively attached to HMM-165, we operated as a standalone detachment that flew and maintained our own aeroplanes. Our pilots were occasionally paired up with aviators from VMA-211, and these mixed sections got the job done just as well as an all VMA-211 or VMA-311 formation. Although we still wore our HMM-165 patches on our flight suits and briefed and flew our own schedules, we worked very closely as a Harrier Team in Iraq. Indeed, we all used the call sign "Torment" to ensure that aviation planners and ground units alike knew that they would be getting an identical level of support regardless of who arrived overhead.

An aerial view of the city of Ramadi, the capital of the Al Anbar governorate in western Iraq, taken from a VMA-513 Harrier II on 8 July 2006. The 'Nightmares' saw extensive action supporting the Battle of Ramadi, which commenced in June 2006 and continued until November of that year. A combined force of US Army, US Marines Corps, US Navy SEALs and Iraqi security forces fought insurgents for control of key locations in Ramadi, including the local government building and the general hospital. The Coalition strategy relied on establishing a number of patrol bases called Combat Operation Posts throughout the city, and these relied on CAS by Harrier IIs, amongst other Coalition TACAIR types (*Lt Col Willis Price*)

'This deployment was very different to OIF I. The first time I was in Iraq in 2003, we dropped bombs on almost every mission. Going back the second time, we did not drop that much ordnance since the war had transitioned into its counterinsurgency phase. When 15th MEU-SOC went ashore, it was on the eve of the troop "surge" recommended by the Iraq Study Group Report. Our infantry companies from *Boxer* went in Ramadi, Haditha and Ar Rutbah, where the MEU command element was based.

'Sectarian violence was on the increase across Iraq, and we were very conscious of that when we first started flying missions. We frequently supported patrols and raids carried out by Marine infantry units and Navy SEALs. We would conduct overwatch or route reconnaissance, looking for insurgents placing IEDs or setting up ambushes. We had to be ready to strike at anyone that threatened the ground forces. Although we were very busy, we did not drop a lot of bombs because of the strict ROE, and the concerted effort to avoid collateral damage that inevitably alienated the local population.

'Both our det and VMA-211 operated around the clock. We usually added two sections to the VMA-211 flight schedule every day. With the "Avengers", we worked morning, midday and night crews that overlapped each other in order to provide our troops with armed Harriers for round-the-clock operations. You would be on one of the shifts for a month to six weeks, before switching to another time. This meant that you could be flying night missions only for weeks at a time.

'Our MEU jets were all radar-equipped Harriers. We ended up giving VMA-211 one of our jets when the unit had a maintenance issue just prior to ferrying its jets home to MCAS Yuma in March 2007. The "Avengers" didn't have time to fix the aircraft, so we took ownership of the broken Night Attack jet. We soon had it flying again, the Harrier becoming our detachment flagship with the Vietnam-era "Tomcat" on its tail.

'Unlike Harrier units at Al Asad before or after us, we enjoyed so much tanker support during our deployment that we were able to leave the

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Like VMA-513 'Det A' before it, VMA-542 'Det A' conducted its OIF missions exclusively from the flightdeck of its amphibious assault ship – in this case USS *Iwo Jima* (LHD-7). This aircraft, awaiting clearance for takeoff in November 2006, is armed with a 500-lb GBU-38 JDAM on its inner port wing pylon (*US Navy*)

external fuel tanks off our jets. Our typical load for a section of two AV-8Bs was one 500-lb GBU-38 JDAM, one 500-lb GBU-12 LGB, one AGM-65E Laser Maverick, the GAU-12 25 mm cannon and a five-inch Zuni rocket pod. Each aircraft also carried a Litening II pod. This diverse load-out gave us excellent flexibility since we usually only delivered one weapon per engagement at that time.

'The big benefit of having KC-130 refuelling support at the same airfield was responsive aerial refuelling that gave us more time on station without trading two weapons stations for fuel tanks. We would take off from Al Asad and immediately replenish our fuel tanks from the duty KC-130, then fly for an hour to fill a "Vulnerability Window", before going back to the tanker again so that we could remain on station for another hour. The KC-130s were nearly always airborne, so if we had troops in contact we could get fuel and stay out longer. The tanker guys were very supportive, providing fuel anytime we asked for it.

'The connection between the Litening II pod and the FAC via the ROVER terminal was very important to us whilst in Iraq. In fact, it got to the point where your mission effectiveness was compromised if it was unavailable. The ground commander always wanted to see ROVER footage of what we were seeing so as to minimise the risk of collateral damage should ordnance be employed.

'The situation was pretty volatile in-theatre when we showed up in the NAG, and that was why CENTCOM put the MEU ashore. Our pilots got very good at road reconnaissance and looking for IEDs, and we also supported raids at night. We had Scan Eagle UAVs flying out of Al Asad too, and the Marines on the ground used them a lot. Nevertheless, we provided the bulk of the ISR for the battalions in-country during this period.

'VMA-211 went home in March 2007, but we stayed for an extra month so as to help VMA-231 get acclimated to operations in Iraq. We would fly a section with a VMA-311 pilot as the flight lead and a VMA-231 pilot as the wingman, thus giving the latter a chance to experience the frequencies, airspace etiquette and ROE in-theatre.

'Much of the sectarian violence had settled down in Al Anbar Province by the time we left in April 2007, and I like to think that we helped achieve this.'

VMA-311 Detachment A flew 1200 hours with six jets from Al Asad.

The full set of equipment that comprised the L3 Remote Operational Video Enhanced Receiver (ROVER III), as used by Marine Corps FACs and ground commanders to view real time imagery from Litening II pods carried by AV-8Bs, F/A-18s and UAV systems. ROVER became a critical piece of equipment in the war in Iraq since it significantly enhanced situational awareness and command and control (*L3*)

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OIF V/VI

In January 2007 President George W Bush announced a new strategy, which he called 'The New Way Forward' or the 'surge', to quell violence in Iraq. The President extended the tour of duty for US Army personnel, as well as some elements of the Marine Corps in Al Anbar Province (namely 13th MEU, 1st Battalion, 6th Marines and 3rd Battalion, 4th Marines) and sent additional forces to Iraq. This meant a net increase of 21,000 US troops in-theatre, of which 4000 were Marines in Al Anbar Province. The aim of the 'surge' was, in the words of the President, 'to help the Iraqis to clear and secure neighbourhoods, to help them protect the local population and to help ensure that the Iraqi forces left behind are capable of providing security'.

A part of the 'surge', Gen David Petraeus assumed command of the Multinational Forces Iraq. The new approach focused more on a counter-insurgency strategy to win the support of the population, repair broken infrastructure and also pay former insurgent groups to support security operations. On 9 February 2007, II MEF took over operations in Iraq for a second time, and a week later 2nd MAW, led by Brig Gen Timothy Hanifen, replaced 3rd MAW. Finally, MAG-16 was relieved by MAG-29, led by Col John Kennedy. Recalling the switchover, Kennedy noted;

'I have derived a great sense of satisfaction from taking command, having had great work-ups and exercises to prepare us. We have also had a couple of weeks of good turnover with MAG-16. When 3 February came around we were ready to go. In OIF I in 2003, MAG-29 had been the aviation component for Task Force Tarawa, and it is appropriate that we are here again. The squadrons that are here are manned by experienced, combat-tested crews, and are doing things extremely well, and our major focus is to ensure they have the guidance and resources for continued success.'

MAG-29 had operational control of all 2nd MAW squadrons, which flew CH-46 Sky Knights, CH-53 Super Stallions, AH-1W Super Cobras, KC-130J Hercules, F/A-18 Hornets and AV-8B Harrier IIs.

A month after MAG-29 arrived in Iraq VMA-231 flew in from MCAS Cherry Point to replace VMA-211. 'The Harrier's role is to provide CAS for the Marine on the ground', squadron pilot Maj Mark Riedy told a 2nd MAW PAO several weeks into the unit's deployment to Al Asad. 'Recently things have quietened down, so when we go out there we are searching various points for enemy activity, suspicious activity – IEDs – and those types of things. We pass the information along to the Marines on the ground, and then, if we have troops in contact, we are there to support them'.

A section of Harrier II+s from VMA-231 hold station behind a KC-130T over the deserts of western Iraq on 1 May 2007. Unusually, neither aircraft carries external drop tanks, these being replaced by two GBU-38s on the lead jet and at least one AGM-65E on the second AV-8B+ (*Ed Darack*)

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VMA-231 completed its first, and last, deployment to Al Asad between March and September 2007, the 'Aces' flying 1738 combat sorties totalling 5158 flight hours during this period. Armed with an AGM-65E, this aircraft is departing on a routine OIF patrol. Much of the squadron's time in the air was spent searching western Iraq for suspicious enemy activity, especially the planting of IEDs (*US Marine Corps*)

Lt Col Brian Annichiarico, CO of VMA-231, remarked at the same time;

'I think my Marines have done a fantastic job so far. This is the first squadron deployment in a few years, and everybody was chomping at the bit to come. We tried to prepare them mentally as much as we could prior to coming over here. It is not the work of just a few Marines that has made the squadron successful in Iraq, but the efforts of every person that allows the "Aces" to do what they do best. If a maintainer does not fix a jet or a helicopter, then the helicopter or jet cannot fly, and the guys on the ground don't get the support. If the guys on the ground don't get the support they need, then there may be additional risks that they are forced to accept, and so on and so forth. It never ceases to amaze me how that whole chain works. The reason it works so well is because of the individual efforts of the Marines out there.'

As Lt Col Annichiarico noted, VMA-231 had not deployed to Iraq since OIF I, although it had supported MEUs that had deployed elsewhere since then. Between March and September 2007, the 'Aces' flew 1738 combat sorties totalling 5158 flight hours.

Sustaining this mission tempo was the job of the hardworking maintainers, whose motivation was a primary concern of pilots like Maj Reidy;

'As long as they see us launching and dropping ordnance and coming back, they stay pretty motivated. We've been trying to make a habit out of telling them what we're doing, showing them maps and picking out the areas that we're going to, and telling them that it's not just about dropping bombs – we're out there providing support to the Marines.'

Harrier II pilot Maj Shawn Hermley supported VMA-231 and other Marine TACAIR units during their time in Iraq whilst serving as the Regimental Air Officer for RCT-6 at Camp Fallujah, in Al Anbar Province, from January 2007 through to February 2008;

'It was my job to coordinate and prioritise aviation support for one Army and four Marine battalions. This also included advising the regimental commander on the use of aviation. Day to day we processed joint tactical air strike requests. Typically, we were working three different schedules for such requests – targets that were to be hit three days from now, two days from now and the next day. We were also responsible for diverting air operations in real time to support battalion needs in their areas of operations. In addition, I coordinated with the forward-based air wing to ensure that it dealt with our requests. We had two Harrier squadrons in-theatre while I was there, VMA-231 and VMA-542, with support from VMA-513's "Det A".

An AV-8B from VMA-513 Detachment A of 13th MEU-SOC/HMM-163 closes on the flightdeck of *Bonhomme Richard* on 15 September 2007 at the end of a training mission in the NAG. The unit supported Coalition operations in Iraq from both LHD-6 and Al Asad from June to late September 2007 (*US Navy*)

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'By that time both the Harrier and the Hornet carried Litening pods. We also had ROVER with every FAC, in battalion HQs and forward units. Indeed, it seemed like everyone and their mother had a ROVER. For some reason the feed from the Harrier's Litening pod had a much nicer display than that of the Hornet. The difference was the Harrier's ROVER display had the MGRS [Military Grid Reference System] grid coordinates on it, as well as the latitude and longitude, so the FAC could see just what the pod was seeing, plus all the coordinates. The Hornet's ROVER display got a "quick-and-dirty" integration with the Litening pod, as the jet was scheduled to receive the new Raytheon AN/ASQ-28 FLIR.

Ordnance Marines of VMA-542 unload SUU-25 flare dispensers from a trailer before moving them over to the AV-8Bs parked behind them on 14 March 2008 at Al Asad. This system was periodically used by Harrier II units in-theatre for battlefield illumination at night (*US Marine Corps*)

'For the FAC, his display was better from the Harrier, and he could see all the data on the ground on the ROVER including the pod view and MGRS grids, and he could track the path of the jet during its attack run to make sure the pilot was right on target. The fire cell at the command centre could also see the MGRS grid, and confirm that the pilot was indeed right on target and nearby friendlies were safe.

'While I was in-theatre RCT-6 fought a successful campaign against IED emplacers. These engagements typically took place during the day, although there were night contacts too. We usually found them via a UAV, which had the endurance to remain over the battlefield searching out targets such as this for hours on end. We could access the UAV video feed in RCT-6, having arranged this with the UAV mission commanders – both Marine UAV operators and Scan Eagle contract personnel.

'Every once in a while we would get a call from one of the UAV mission commanders who would say, "You might want to pull up this feed and see what is going on". In the same way, we sometimes received cueing from manned aircraft – often a Harrier – to look at something. Following the ROE, the confirmation that a group was hostile often came from a UAV, as its operator would see a guy carrying an AK-47 or trailing a wire from an IED.

Marine Corps maintenance personnel from VMA-223 'Det A' had to be flown in to Ali air base, near An Nasiriyah, from *Kearsarge*, along with their support equipment (including a wing stand), on 11 October in order to repair AV-8B Night Attack BuNo 163876, which had been damaged in a hard landing at the base. The Marine Corps received valuable assistance from USAF personnel based at Ali whilst repairing the Harrier II. 'Det A' supported OIF V/VI exclusively from the flightdeck of *Kearsarge* (*US Marine Corps*)

'It was the regiment air centre's job to plan events and then monitor them once they had commenced. Being assigned to RCT-6 was one of my most rewarding tours, as I got to see the high level of air support we provided the battalions in Al Anbar Province, and how the air-ground team began to turn the situation around on the ground. Our ISR became tight, and the word got out that if you dug a hole in the road, you got blown up. We saw that from the groundside as well. We had both "bad guys" and "good-bad guys" who were not as bad as the "bad-bad guys". In time the "good-bad" guys became our friends and joined the neighbourhood watch, and they

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VMA-542 plane captain PFC Craig Phelps conducts last minute checks on his Harrier II+ at Al Asad on 17 November 2007. The 'Tigers' supported the OIF mission from September 2007 through to April 2008 – the last of four such deployments from OIF I through to OIF VI (*US Marine Corps*)

Checks completed, a Harrier II+ from VMA-542 taxies out from the squadron dispersal and heads for one of Al Asad's long runways on 17 November 2007. One of the 'Tigers" primary missions during their final Iraq deployment was called 'aeroscout', which saw sections of Harrier IIs searching for tankers carrying stolen oil across the Iraqi desert to Syria or Turkey. Once a suspicious tanker was found, a heli-borne Quick Reaction Force consisting primarily of infantry was called in by VMA-542 to investigate the vehicle (*US Marine Corps*)

helped locals to point out the foreign fighters. They did not like us, but figured out that if they wanted some security, they had to work with us to counter the insurgency.

'Seeing the role aviation played in this phase of OIF was very interesting. It was also sobering to witness the effects of an air attack that went awry, and the problems this created for the ground commander who had to regain the trust of the locals. I walked away from this incident with a very different perspective on the employment of aviation fires than I had prior to it. From then on, even if a situation met the ROE for employing ordnance, I always asked myself the following question – "I know you are a bad guy and I can strike now, but should I as there is the risk of collateral damage?" I routinely heard the frustration in pilots' voices as they circled in the sky above us hunting somebody that they knew was up to no good, and although there were clearly no collateral damage issues, battalion continued to say "No, we do NOT want them hit". It was tough to take at times.

'On several occasions I had to have conversations with the Ops O [Operations Officer] and pilots from one particular squadron in order to explain to them what it was we were seeing on the ground, as opposed to their view from the air. Ultimately, it was up to the battalion commander to decide if he wanted to engage a target in his area of operations, and as the Regimental Air Officer it was my job to provide air support only if it was requested.'

In support of the 'surge' to support peacekeeping, 13th MEU-SOC/HMM-163 sent VMA-513 Detachment A and its six Harrier IIs to Al Asad from *Bonhomme Richard* in June 2007. Capt Keith Bucklew, VMA-513's training officer for the detachment, remarked at the time;

'From integrating with VMA-231 to getting and keeping the birds operationally ready, the Marines have done a great job. We were less kinetic than in my 2006 deployment to Al Asad with VMA-513, and in most of our missions we performed surveillance in support of Marines in operations

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AV-8Bs from VMA-311 prepare to take off from MCAS Cherry Point in the rain at the start of the unit's deployment to Al Asad on 27 March 2008. This proved to be an historic moment, as VMA-311 was the last Harrier II unit to deploy in squadron strength (ten aircraft) to Al Asad (*Capt Eric Hugg*)

in rural areas. We also flew numerous convoy route search missions. We focused more on scanning the terrain from higher altitude in search of bad guys emplacing IEDs. Since our Litening II pods could send an image to ROVER terminals on the ground, FAC and command centres could see what we could see, thus helping us with the positive ID of potential targets. The move to a digital data link helped improve the range over which we could send images from the pod, and it also greatly enhanced the quality of those images.'

Bucklew added that the detachment had completed 545 flying hours and 671 sorties in the first 30 days that 'Det A' operated from Al Asad, with the mission focus remaining on convoy escorts and IED surveillance throughout this period.

LCpl Adam Horn was one of the maintenance personnel sent ashore with 'Det A', the airframe mechanic commenting, 'When we arrived, it was good to see VMA-231 out here, working hard keeping the birds in the air'. While at Al Asad, VMA-513 swelled VMA-231's ranks to 16 jets, 27 pilots and 250 maintainers.

In September VMA-513 'Det A' returned to *Bonhomme Richard* for the return voyage home, its place being taken by VMA-223 Detachment A, which was part of 22nd MEU-SOC/HMM-261 embarked in *Kearsarge*. On this occasion, however, the six Harrier IIs flew their OIF missions from the carrier. Lt Col John Adams was the detachment commander;

'We were tasked with providing on call CAS, but the majority of our time was spent gathering information and keeping an eye out for anything unusual. I can tell you the ground units we supported appreciated the fact that we were overhead providing capabilities that they might not have otherwise received if 22nd MEU-SOC had not been there.'

Two VMA-311 aircraft refuel from a USAF KC-10 tanker over the Middle East on the final leg of their flight to Iraq on 30 March 2008 (*Capt Eric Hugg*)

The *Kearsarge* amphibious group departed the NAG and sailed further east into the Indian Ocean in October, thus bringing VMA-223's brief OIF VI commitment to an end.

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The 'view from the office'. Capt Eric Hugg took this self-portrait high over the Atlantic during VMA-311's historic final deployment to Iraq in March 2008 (*Capt Eric Hugg*)

By then responsibility for Harrier II operations from Al Asad had been passed on to VMA-542, which had arrived in-theatre for its OIF deployment in September. The unit would operate from the base until April 2008. Maj Jeremy Gettings was serving with the 'Tigers' during this time;

'I was the maintenance officer for VMA-542. This was my second deployment to Iraq, and the major difference this time round was the AV-8B's JDAM capability. One of our primary missions was called "aeroscout", searching for tankers carrying stolen oil across the Iraqi desert. The bad guys were stealing both oil and gas and then trucking the stuff to Syria or Turkey. Once a suspicious tanker was found, a heli-borne Quick Reaction Force consisting primarily of infantry was launched to investigate.'

On 30 January 2008, 3rd MAW, led by Brig Gen Randolph Alles, replaced 2nd MAW at Al Asad. Two months later VMA-311, with 160 Marines and ten AV-8Bs, became the final Harrier II unit to deploy to Al Asad. In June VMA-311's Detachment A, assigned to 15th MEU-SOC/HMM-165 embarked in *Peleliu*, briefly supported OIF and maritime operations from the NAG.

Maj Jerome Whalen, who was second in command of VMA-311 at Al Asad, told a 3rd MAW PAO, 'Because minimal ordnance is being dropped, most of the squadron's time was spent doing nontraditional intelligence surveillance and reconnaissance missions. In any counter-insurgency, intelligence is key. For example, when Senator Barack Obama visited Ramadi on 22 July 2008, I was asked to perform route reconnaissance prior to his convoy getting underway. We did this by using the Litening II pod to locate any suspicious activity or anything that looked out of the ordinary'.

Marine Corps ordnance personnel from VMA-311 'Det A' service the linkless feed system for the 300-round magazine in the Harrier II's GFK-11/A49E right fuselage pod on the flightdeck of LHA-5 on 15 September 2008. 'Det A' supported Coalition forces in OIF VI exclusively from *Peleliu* whilst it sailed in the NAG (*US Navy*)

On 15 October 2008 VMA-311 returned to MCAS Yuma from Al Asad. 'The "Tomcats" had ten aircraft in-theatre, and we flew more than 2000 missions with them during the deployment', Maj Whalen told a reporter from *The Desert Warrior*, the MCAS Yuma base newspaper. 'On the vast majority of our missions, we found something of interest. However, we did not always receive feedback of what it actually was. On one occasion, our aviation maintenance officer, Maj Charles DelPizzo, successfully located an IED from the air. We didn't fly as many hours as in previous deployments. This is a different fight now to what it was a year

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ago. Indeed, our "ordies" were loading the bombs, but we weren't dropping any, which was a good thing.

'This has certainly been a milestone deployment for the Harrier community, as to the best of my knowledge this is the first time we have not been replaced by another AV-8B unit since we started deploying to Al Asad in 2004, and in my opinion that is a clear sign we are winning the fight.'

VMA-311 was indeed the final AV-8B Harrier II unit to operate from an Iraqi airfield. As US forces withdrew from the country, Al Asad remained one of the last American-occupied bases in Al Anbar Province. In 2009-10, personnel from II MEF removed the majority of the support equipment at the base, and in March 2010 the Marine Corps concluded its operations at Al Asad. The last remaining civilian personnel were airlifted from the base on 16 December 2011 and the airfield officially closed 15 days later.

The last *Tarawa* class amphibious assault ship in active service, *Peleliu* has conducted numerous NAG deployments since its commissioning in May 1980. VMA-311 'Det A' of 15th MEU-SOC/ HMM-165 flew some of the last missions conducted by Harrier IIs in OIF from the flightdeck of LHA-5 (*US Navy*)

This VMA-311 'Det A' jet wears the insignia of 2nd Battalion, 5th Marines, as well as the name of the battalion's commanding officer, Lt Col Todd Eckloff, on its nose. The most highly decorated battalion in the Marine Corps, '2/5' was stationed in Ramadi during LHA-5's time in the NAG in 2008 (*US Navy*)

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APPENDICES

AV-8B HARRIER II UNIT DEPLOYMENTS TO OSW AND OIF I-VI

VMA-211 'WAKE ISLAND AVENGERS'

OSW

January 1997 – VMA-211 'Det A', 11th MEU-SOC/HMM-166, USS *Essex* (LHD-2)

May-June 1998 – VMA-211 'Det A', 11th MEU-SOC/HMM-268, USS *Tarawa* (LHA-1)

OSW/OIF

February-May 2003 – VMA-211, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6)

September 2004-February 2005 – VMA-211 'Det A', 31st MEU-SOC/HMM-265, USS *Essex* (LHD-2) and Al Asad

September 2005-January 2006 – VMA-211 'Det A', 13th MEU-SOC/HMM-163, USS *Tarawa* (LHA-1) and Al Asad

September 2006-March 2007 – VMA-211, Al Asad

VMA-214 'BLACK SHEEP'

OSW

September 1996 – VMA-214 'Det A', 13th MEU-SOC/HMM-163. USS *Tarawa* (LHA-1)

March-April 1999 – VMA-214 'Det A', 13th MEU-SOC/HMM-364, USS *Boxer* (LHD-4)

OSW/OIF

February-May 2003 – VMA-214, Ahmed Al Jaber

May-August 2004 – VMA-214, Al Asad

September 2004-February 2005 – VMA-214 'Det A'. 11th MEU-SOC/HMM-166, USS *Belleau Wood* (LHA-3) and Al Asad

April-June 2006 – VMA-214 'Det A', 11th MEU-SOC/HMM-166, USS *Peleliu* (LHA-5)

VMA-223 'BULLDOGS'

OSW/OIF

February-May 2003 – VMA-223, I MEF/ATF-E, USS *Bataan* (LHD-5)

August 2005-March 2006 – VMA-223, Al Asad

December 2005-March 2006 – VMA-223 'Det A', 22nd MEU-SOC/HMM-261, USS *Nassau* (LHA-4) and Al Asad

September-October 2007 – VMA-223 'Det A', 22nd MEU-SOC/HMM-261, USS *Kearsarge* (LHD-3)

VMA-231 'ACES'

OSW/OIF

February-May 2003 – VMA-231 'Det A', 24th MEU-SOC/HMM-263 and I MEF/ATF-E, USS *Nassau* (LHA-4)

March-September 2007 – VMA-231, Al Asad

VMA-311 'TOMCATS'

OSW

January 1996 – VMA-311 'Det A', 15th MEU-SOC/HMM-268, USS *Peleliu* (LHA-5) and Ali-Al-Salem

OSW/OIF

February-June 2003 – VMA-311, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6)

February-June 2003 – VMA-311 'Det A', 15th MEU-SOC/HMM-161 and I MEF/ATF-W, USS *Tarawa* (LHA-1)

November 2004-May 2005 – VMA-311, Al Asad

November 2006-April 2007 – VMA-311 'Det A', 15th MEU-SOC/HMM-165, USS *Boxer* (LHD-4), and Al Asad

March-October 2008 – VMA-311, Al Asad

June-July 2008 – VMA-311 'Det A', 15th MEU-SOC/HMM-165, USS *Peleliu* (LHA-5)

VMA-513 'NIGHTMARES'

OSW

May-June 1997 – VMA-513 'Det A', 15th MEU-SOC/HMM-161, USS *Peleliu* (LHA-5) and Ali-Al-Salem

October 1998 – VMA-513 'Det A', 15th MEU-SOC/HMM-163, USS *Essex* (LHD-2) and Ali-Al-Salem

OIF

March-May 2005 – VMA-513 'Det A', 15th MEU-SOC/HMM-165, USS *Bonhomme Richard* (LHD-6) and Al Asad

March-September 2006, VMA-513, Al Asad

June-September 2007 – VMA-513 'Det A', 13th MEU-SOC/HMM-163, USS *Bonhomme Richard* (LHD-6) and Al Asad

VMA-542 'TIGERS'

OSW/OIF

February-May 2003 – VMA-542, I MEF/ATF-E, USS *Bataan* (LHD-5)

May-November 2004 – VMA-542, Al Asad

November 2006 – VMA-542 'Det A', 24th MEU-SOC/HMM-365, USS *Iwo Jima* (LHD-7)

September 2007-April 2008 – VMA-542, Al Asad

AV-8B HARRIER IIs INVOLVED IN OIF I-VI

OIF I

VMA-231 'Det A', 24th MEU-SOC/HMM-263 and I MEF/ATF-E, USS *Nassau* (LHA-4), 2-5/03

BuNos 164560, 164570, 164571, 165003, 165390, 165391

VMA-223, I MEF/ATF-E, USS *Bataan* (LHD-5), 2-5/03

BuNos 163863, 163864, 164569, 165354, 165355, 165380, 165384, 165385, 165386, 165387

VMA-542, I MEF/ATF-E, USS *Bataan* (LHD-5), 2-5/03

BuNos 163880, 164140, 164150, 164151, 164551, 164554, 164556, 164557, 164559, 165001, 165004, 165307, 165309, 165310, 165311, 165312

VMA-211, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6), 2-5/03

BuNos 163872, 164119, 164128, 164152, 165006, 165423, 165425, 165569, 165588, 165590

VMA-311, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6), 2-5/03

BuNos 163869, 164142, 164153, 165398, 165418, 165427, 165428, 165566, 165573, 165574, 165583, 165591

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VMA-311 'Det A', 15th MEU-SOC/HMM-161 and I MEF/ATF-W, USS *Tarawa* (LHA-1), 2-6/03
BuNos 163874, 164117, 164566, 165422, 165430, 165572

VMA-214, Ahmed Al Jaber, 2-5/03
BuNos 164553, 165397, 165421, 165424, 165567, 165568, 165570, 165578, 165579, 165580, 165581, 165584, 165586, 165587, 165589, 165592

OIF II

VMA-214, Al Asad, 5-8/04
BuNos 163869, 164148, 165417, 165426, 165429, 165578, 165580, 165581, 165586, 165589

VMA-542, Al Asad, 5-11/04
BuNos 163880, 164151, 164554, 164556, 164557, 165001, 165307, 165311, 165380, 165381

VMA-214 'Det A', 11th MEU-SOC/HMM-166, USS *Belleau Wood* (LHA-3) and Al Asad, 7/04-2/05
BuNos 164134, 164154, 165389, 165570, 165582, 165592

VMA-211 'Det A', 31st MEU-SOC/HMM-265, USS *Essex* (LHD-2) and Al Asad, 9/04-2/05
BuNos 164119, 164128, 165567, 165587, 165588, 165595

VMA-311, Al Asad, 11/04-5/05
BuNos 163874, 164143, 165397, 165422, 165427, 165428, 165430, 165573, 165583, 165584, 165591

VMA-513 'Det A', 15th MEU-SOC/HMM-165, USS *Bonhomme Richard* (LHD-6) and Al Asad, 3-6/05
BuNos 163870, 164146, 165418, 165420, 165576, 165582

OIF III

VMA-223, Al Asad, 8/05-3/06
BuNos 163876, 163879, 164559, 164562, 165311, 165354, 165356, 165383, 165387, 166287

VMA-211 'Det A', 13th MEU-SOC/HMM-163, USS *Tarawa* (LHA-1) and Al Asad, 9/05-1/06
BuNos 164128, 164545, 164553, 165006, 165421, 165425

VMA-223 'Det A', 22nd MEU-SOC/HMM-261, USS *Nassau* (LHA-4) and Al Asad, 12/05-3/06
BuNos 163863, 163864, 165003, 165357, 165384, 165386

OIF IV

VMA-513, Al Asad, 3-9/06
BuNos 163869, 163870, 164566, 165568, 165572, 165578, 165582, 165586, 165588, 165589

VMA-214 'Det A', 11th MEU-SOC/HMM-166, USS *Peleliu* (LHA-5), 4-6/06
BuNos 164134, 164148, 164570, 164580, 165581, 165592

VMA-542 'Det A', 24th MEU-SOC/HMM-365, USS *Iwo Jima* (LHD-7), 11/06
BuNos 163880, 164140, 165001, 165004, 165005, 166288

VMA-211, Al Asad, 9/06-3/07
BuNos 163869, 163870, 164566, 165568, 165572, 165578, 165582, 165586, 165588, 165589

VMA-311 'Det A', 15th MEU-SOC/HMM-165, USS *Boxer* (LHD-4) and Al Asad, 11/06 to 4/07
BuNos 164571, 165427, 165428, 165583, 165584, 165595

OIF V/VI

VMA-231, Al Asad, 3-9/07
BuNos 164557, 164558, 164560, 164567, 164570, 165306, 165388, 165390, 165593, 166287

VMA-513 'Det A', 13th MEU-SOC/HMM-163, USS *Bonhomme Richard* (LHD-6) and Al Asad, 6-9/07
BuNos 165420, 165567, 165569, 165582, 165587, 165590

VMA-223 'Det A', 22nd MEU-SOC/HMM-261, USS *Kearsarge* (LHD-3) 9-10/07
BuNos 163864, 163876, 164562, 165357, 165384, 165387

VMA-542, Al Asad, 9/07-4/08
BuNos 164557, 164558, 164560, 164567, 164570, 165306, 165388, 165390, 165393, 166287

VMA-311, Al Asad, 3-10/08
BuNos 165382, 165420, 165566, 165570, 165577, 165584, 165587, 165589, 165591, 165595

VMA-311 'Det A', 15th MEU-SOC/HMM-165, USS *Peleliu* (LHA-5), 6-7/08
BuNos 163870, 164117, 165567, 165569, 165580, 165581

COLOUR PLATES

1
AV-8B BuNo 163675 of VMA-311 Detachment A, 15th MEU-SOC/HMM-268, USS *Peleliu* (LHA-5) and Ali-Al-Salem, January 1996
AV-8B build number 150, BuNo 163675 was constructed as a Night Attack Harrier II and delivered to VMA-311 at MCAS Yuma on 26 April 1989. In early 1996 this aircraft and five others in VMA-311's 'Det A' flew OSW missions for several weeks from Ali-Al-Salem air base in Kuwait. The Harrier IIs were armed with an interesting combination of AGM-65 Maverick air-to-surface missiles, AGM-122 Sidearm anti-radiation missiles and AIM-9M air-to-air missiles. In 2000, after being damaged, this aircraft was rebuilt into Harrier II+ BuNo 165580, which was delivered to VMA-214 at MCAS Yuma on 22 January 2002.

2
AV-8B Bu No 164145 of VMA-211 Detachment A, 11th MEU-SOC/HMM-166, USS *Essex* (LHD-2) and Ahmed Al Jaber, January 1997
AV-8B build number 218, Night Attack aircraft BuNo 164145 was delivered to VMA-513 at MCAS Yuma on 15 September 1992. Transferred to VMA-211 several years later, the Harrier II participated in OSW missions with the unit's 'Det A' from Ahmed Al Jaber air base in Kuwait. The aircraft remained assigned to VMA-211 until it suffered a catastrophic in-flight fire and crashed while conducting a routine training mission over MCAS Twenty-Nine Palms, California, on 21 June 2000. The pilot safely ejected from the stricken fighter.

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3
AV-8B BuNo 164121 of VMA-513 Detachment A, 15th MEU-SOC/HMM-163, USS *Essex* (LHD-2) and Ali-Al-Salem, October 1998

AV-8B build number 198, Night Attack Harrier II BuNo 164121 was delivered to VMA-311 at MCAS Yuma on 2 February 1991. The aircraft has served with several squadrons since then, and undertook a number of OSW missions with VMA-513 'Det A' in October 1998 whilst land-based in Kuwait. It is presently assigned to VMA-542.

4
AV-8B BuNo 163870 of VMA-214 Detachment A, 13th MEU-SOC/HMM-364, USS *Boxer* (LHD-4), North Arabian Gulf, March-April 1999

AV-8B build number 179, this Night Attack Harrier II was delivered to VMA-214 at MCAS Yuma on 31 January 1990. It was one of six jets assigned to VMA-214 'Det A' embarked in *Boxer* in 1998-99, and it flew a handful of OSW missions. The aircraft subsequently served with VMA-513 and participated in OIF II, deployed with 15th MEU/HMM-165 aboard USS *Bonhomme Richard* (LHD-6) in 2005. The aircraft flew from Al Asad with the detachment between March and June 2005, and returned to Iraq with VMA-513 in March 2006. It was transferred to VMA-211 at Al Asad in September of that year, remaining in-theatre until March 2007. The aircraft participated in VMA-311 'Det A's' deployment with 15th MEU/HMM-165 aboard USS *Peleliu* (LHA-5) in 2008, flying some of the final OIF VI missions from the vessel in June-July 2008. BuNo 163870 is presently assigned to VMA-214.

5
AV-8B BuNo 165391 of VMA-231 'Det A', 24th MEU-SOC/HMM-263 and I MEF/ATF-E, USS *Nassau* (LHA-4), Northern Arabian Gulf, March 2003

AV-8B build number 286, this aircraft was delivered to VMA-542 on 11 June 1999 and later transferred to VMA-231. One of six aircraft embarked by 'Det A' in LHA-4 in late August 2003 for the vessel's scheduled deployment to Fifth Fleet's AOR, it had the dubious distinction of being the only Harrier II to be lost during OIF I when it crashed while approaching *Nassau* during a night recovery on 1 April 2003. The pilot successfully ejected and BuNo 165391 remained afloat long enough for it to be recovered.

6
AV-8B BuNo 165580 of VMA-214, Ahmed Al Jaber, April 2003

AV-8B build number 317, radar-equipped AV-8B Harrier II+ BuNo 165580 was delivered to VMA-214 on 18 January 2002. This remanufactured aircraft used parts from AV-8B day attack aircraft BuNo 163675 (see profile 1). Note the bomb tally just forward of the intake and the name of legendary World War 2 ace and unit founder 'Pappy' Boyington beneath the cockpit. VMA-214 has long had a tradition of adorning the CO's jet with Boyington's name. BuNo 165580 was one of ten Harrier IIs that VMA-214 sent to Al Asad for four months in May 2004 as part of OIF II. Subsequently transferred to VMA-311, the aircraft spent more time patrolling over Iraq and the NAG in June-July 2008 as part of the unit's 'Det A', embarked in LHA-5 with 15th MEU-SOC/HMM-165. These missions were flown exclusively from *Peleliu*, rather than from Al Asad. BuNo 165580 is presently serving with VMA-513.

7
AV-8B BuNo 164119 of VMA-211, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6), Northern Arabian Gulf, March 2003

AV-8B build number 196, Night Attack Harrier II BuNo 164119 was delivered new to VMA-311 at MCAS Yuma on 10 December 1990. Seeing action from LHD-6 during OIF I, the aircraft returned to Iraq with VMA-211 'Det A' in September 2004 when it departed LHD-2 with the rest of 31st MEU-SOC/HMM-265 and flew to Al Asad. After serving with various squadrons since then, the fighter was lost on 18 July 2010 while attacking the Pinecastle bombing range in Florida. The jet was assigned to VMA-542 and flying from LHD-3 in the final stages of 31st MEU-SOC/HMM-262's pre-deployment work-ups at the time. The pilot ejected safely.

8
AV-8B BuNo 165004 of VMA-542, I MEF/ATF-E, USS *Bataan* (LHD-5), North Arabian Gulf, April 2003

AV-8B build number 260, radar-equipped Harrier II BuNo 165004 was delivered to VMA-231 in 26 May 1995. Assigned to various units over the past 18 years, it saw combat in OIF I with VMA-542. The jet is presently serving with VMA-231 once again.

9
AV-8B BuNo 165583 of VMA-311, I MEF/ATF-W, USS *Bonhomme Richard* (LHD-6), Northern Arabian Gulf, April 2003

AV-8B build number 320 was a remanufactured aircraft that used parts from BuNo 163690. Delivered to VMA-311 at MCAS Yuma on 28 March 2002, the jet was one of 12 Harrier IIs embarked by the unit in LHD-6 in January 2003 and sent to the NAG for OIF I. It returned to Iraq with VMA-311 in November 2004, when the squadron conducted a six-month tour of duty flying from Al Asad. BuNo 165583 was also part of VMA-311's 'Det A' that disembarked from LHD-4 in November 2006 and flew OIF IV missions from Al Asad. The aircraft is presently assigned to VMA-211.

10
AV-8B BuNo 164566 of VMA-311 Detachment A, 15th MEU-SOC/HMM-161 and I MEF/ATF-W, USS *Tarawa* (LHA-1), Northern Arabian Gulf, April 2003

AV-8B build number 251 was delivered to VMA-223 at MCAS Cherry Point on 29 July 1994. Eventually assigned to VMA-311, it was one of six jets that formed 'Det A' within 15th MEU-SOC/HMM-161 aboard LHA-1 in January 2003. Assigned to detachment commander Maj Bradford Gering, this aircraft was adorned with a one-off 'sharksmouth' and eventually wore a bomb tally just forward of the intake. This aircraft subsequently served with VMA-513 at Al Asad between March and September 2006, before being transferred to VMA-211 in-country when the unit squadron replaced the 'Nightmares' – all ten jets from the latter squadron were handed over to the 'Wake Island Avengers'. BuNo 164566 is presently serving with VMA-214.

11
AV-8B BuNo 165429 of VMA-214, Al Asad, June 2004

AV-8B build number 301 was delivered to VMA-311 at MCAS Yuma on 2 October 2000, and by early 2004 it was assigned to VMA-214. The aircraft was one of ten Harrier IIs sent to Al Asad in May 2004 following an upsurge in violence in Iraq. It is presently assigned to VMA-513.

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12
AV-8B BuNo 164556 of VMA-542, Al Asad, July 2004

AV-8B build number 241 was delivered to VMA-542 at MCAS Cherry Point on 6 October 1993. Having seen action in OIF I from LHD-5 with VMA-542 in 2003, this aircraft also flew from Al Asad with the unit between May and November 2004. BuNo 164556 continues to serve with VMA-542.

13
AV-8B BuNo 165595 of VMA-211 Detachment A, 31st MEU-SOC/HMM-265, USS *Essex* (LHD-2) and Al Asad, September 2004 to February 2005

AV-8B build number 332 was remanufactured using parts from BuNo 163188 and delivered to VMA-231 at MCAS Cherry Point on 21 February 2003. Assigned to VMA-211 the following year, it was one of six Harrier IIs deployed from MCAS Iwakuni by the unit as 'Det A' with 31st MEU-SOC/HMM-265 aboard LHD-2. The AV-8Bs spent a number of months ashore at Al Asad following *Essex's* arrival in the NAG. BuNo 165595 returned to Iraq with VMA-311's 'Det A' in November 2006, the unit's six Harrier IIs flying in to Al Asad with 15th MEU-SOC/HMM-165 from LHD-4. This aircraft also participated in the final Harrier II Al Asad OIF deployment, being one of ten jets flown from the base by VMA-311 between March and October 2008. BuNo 165595 is presently serving with VMA-513.

14
AV-8B BuNo 165397 of VMA-311, Al Asad, February 2005

AV-8B build number 287, BuNo 165397 was remanufactured as a radar-equipped Harrier II using parts from BuNo 161589. Delivered to VMA-214 at MCAS Yuma on 8 July 1999, the aircraft went to war with the unit from Ahmed Al Jaber in OIF I. Transferred to VMA-311 the following year, the jet deployed with the squadron to Al Asad in November 2004. BuNo 165397 is presently still assigned to VMA-311.

15
AV-8B BuNo 164562 of VMA-223, Al Asad, October 2005

AV-8B build number 247 was delivered new to VMA-223 at MCAS Cherry Point on 7 February 1994. The aircraft participated in OIF III during the 'Bulldogs" seventh-month tour of duty at Al Asad in 2005-06. BuNo 164562 currently serves with VMA-231.

16
AV-8B BuNo 165006 of VMA-211 Detachment A, 31st MEU-SOC/HMM-265, USS *Essex* (LHD-2) and Al Asad, September 2005 to February 2006

AV-8B build number 262, this aircraft was delivered to VMA-231 at MCAS Cherry Point on 4 October 1995. It saw combat in OIF I with VMA-211 embarked in LHD-6, and then spent four months at Al Asad with Detachment A from the same unit in 2005-06. BuNo 165006 is presently assigned to VMA-513.

17
AV-8B BuNo 165568 of VMA-513, Al Asad, April 2006

AV-8B build number 306 was remanufactured using parts from BuNo 162943 and delivered to VMA-513 at MCAS Yuma on 6 September 2001. Flown from Ahmed Al Jaber by VMA-214 during OIF I, the jet returned to Iraq with VMA-513 in March 2006 and spent a full year at Al Asad – it was assigned to VMA-211 from September 2006. BuNo 165568 was still serving with VMA-211 when it was one of six Harrier IIs from the unit that were destroyed in a Taleban attack on Camp Bastion, in Afghanistan's Helmand Province, at 2215 hrs on 14 September 2012.

18
AV-8B BuNo 165578 of VMA-211, Al Asad, December 2006

AV-8B build number 315 was created using parts from BuNo 163203. Delivered to VMA-214 at MCAS Yuma on 30 November 2001, BuNo 165578 also saw combat in OIF I with the 'Black Sheep' from Ahmed Al Jaber and spent a year at Al Asad in 2006-07 with this unit and VMA-211. And like BuNo 165568, it too met a fiery end in the Taleban raid on Camp Bastion on 14 September 2012.

19
AV-8B BuNo 165595 of VMA-311 Detachment A, 15th MEU-SOC/HMM-165, USS *Boxer* (LHD-4) and Al Asad, November 2006 to April 2007

AV-8B build number 332, BuNo 165595 was remanufactured using parts from BuNo 163188. It was delivered to VMA-231 at MCAS Cherry Point on 21 February 2003. Transferred to VMA-211, the aircraft was one of six Harrier IIs deployed aboard LHD-2 as 'Det A' with 31st MEU-SOC/HMM-265 in 2004-05. Spending time ashore at Al Asad during this cruise, it returned to Iraq with VMA-311 'Det A' in November 2006 when 15th MEU-SOC/HMM-165, disembarked from LHD-4. The aircraft was sent back to Al Asad with VMA-311 in March 2008 when the unit completed the final Harrier II OIF deployment. BuNo 165595 is currently assigned to VMA-513.

20
AV-8B BuNo 164570, VMA-231, Al Asad, April 2007

AV-8B build number 255, this aircraft was delivered to VMA-231 at MCAS Cherry Point on 19 October 1994. It saw combat in OIF I flying with VMA-231's 'Det A' from LHA-4 as part of 24th MEU-SOC/HMM-263, and then flew over Iraq from LHA-5 with VMA-214's 'Det A' between April and June 2006. The jet spent six months at Al Asad with VMA-231 in 2007 (wearing the colourful one-off scheme depicted here, denoting its role as the mount of unit CO, Lt Col Brian Annichiarico), after which it was transferred to VMA-211. BuNo 164570 was also destroyed in the Taleban attack on Camp Bastion on 14 September 2012.

21
AV-8B BuNo 165587 of VMA-513 Detachment A, 13th MEU-SOC/HMM-163, USS *Bonhomme Richard* (LHD-6) and Al Asad, June to September 2007

AV-8B build number 345, remanufactured using parts from BuNo 162960, was delivered to VMA-211 at MCAS Yuma on 22 July 2002. It had been transferred to VMA-214 by year-end, however, and duly deployed with the unit to Ahmed Al Jaber for OIF I. In September 2004 it was part of VMA-211's 'Det A', which went ashore to Al Asad from LHD-2 along with the rest of 31st MEU-SOC/HMM-265. The Harrier II spent three more months at Al Asad in the summer of 2007 when VMA-513 'Det A' disembarked from LHD-6. BuNo 165587 is presently assigned to VMA-311.

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22
AV-8B BuNo 164567 of VMA-542, Al Asad, November 2007

AV-8B build number 252, this aircraft was delivered to VMA-223 at MCAS Cherry Point on 16 August 1994. BuNo 164567 made its OIF debut with VMA-231 at Al Asad in March 2007, and it was one of ten jets left at the base by the 'Aces' for incoming VMA-542 in September of that year. It remains in service with the 'Tigers' in 2013.

23
AV-8B BuNo 165570 of VMA-311, Al Asad, March 2008

AV-8B build number 328 was remanufactured using parts from BuNo 162953 and delivered to VMA-214 at MCAS Yuma on 30 April 2002. It saw combat with the 'Black Sheep' from Ahmed Al Jaber in OIF I in 2003, and was part of the unit's 'Det A' that came ashore to Al Asad from LHA-3 in September 2004. The aircraft returned to Al Asad with VMA-311 in March 2008 when the 'Tomcats' completed the final Harrier II OIF deployment. BuNo 165570 is presently assigned to VMA-211.

24
AV-8B BuNo 163870 of VMA-311 Detachment A, 15th MEU-SOC/HMM-165, USS *Peleliu* (LHA-5), Northern Arabian Gulf, June-July 2008

AV-8B aircraft build number 178 was delivered to VMA-214 at MCAS Yuma on 5 February 1990. Its first exposure to OIF came between March and June 2005 when it went ashore from LHD-6 to Al Asad with VMA-513's 'Det A' as part of 15th MEU-SOC/HMM-165. BuNo 163870 returned to Iraq with the 'Nightmares' in March 2006, and was transferred to VMA-211 six months later when VMA-513 ended its OIF IV deployment. The veteran jet patrolled Iraq and conducted maritime reconnaissance mission over the NAG during the final months of OIF VI whilst serving with VMA-311's Detachment A embarked in LHA-5. BuNo 163870 is currently assigned to VMA-214.

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First published in Great Britain in 2013 by Osprey Publishing
PO Box 883, Oxford, OX1 9PL, UK
PO Box 3985, New York, NY 10185-3985, USA

E-mail: info@ospreypublishing.com
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A CIP catalogue record for this book is available from the British Library

ISBN: 978 1 78096 310 5
PDF e-book ISBN: 978 1 78096 311 2
ePub ISBN: 978 1 78096 312 9

Edited by Tony Holmes
Cover Artwork by Gareth Hector
Aircraft Profiles by Jim Laurier
Index by Mike Parkin
Originated by PDQ Digital Media Solutions, UK

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Acknowledgements

Many individuals supported the development of this book, including Dr Fred Allison, Hank Cole, Lt Col Theodore Herman, Mary Joscelyn, Steven Little, Michael Monahan and Vlado Zavich. Thank you also to Marine Corps Public Affairs Officers (PAOs) Maj Stacy Reidinger and Lt Megan Greathouse. The editor would also like to thank Maj Doug Glover for the provision of OIF I photographs.
Finally, the author would like to thank the following Marine Corps aviators: Capt Keith Bucklew – VMA-513; Lt Col Marcus Annibale – VMA-513; Lt Col Brian Annichiarico – VMA-231; Lt Col Peter Blake – VMA-311; Lt Col Charles DelPizzo – VMA-542, VMA-214 and VMA-311; Lt Col Mark Everman – VMA-214; Lt Col Jeremy Gettings – VMA-311; Lt Col Shawn Hermley – VMA-231; Lt Col Mike Hile – VMA-311; Lt Col Joseph Williams – VMA-214 and VMA-311 'Det A'; Lt Col William Maples – VMA-214; Lt Col Michael Perez – VMA-542; Lt Col Willis E Price – VMA-513; Col Robert Claypool – VMA-214; Col Brad Gering – VMA-211; Col Robert Kuckuk – VMA-311; Col Chris McPhillips – VMA-311; Col Mark Savarese – MAG-13; Col Russ Stromberg – VMA-214; Col Kevin Vest – VMA-211; Col Clyde Woltman – MAG-13 and VMA-311; Brig Gen Russell Sanborn – VMA-542

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Front Cover

On 16 May 2006 Maj Guy Berry and Capt Keith Bucklew of VMA-513, flying from Al Asad, in central Iraq, completed a challenging mission. Taking off in their AV-8Bs during the early hours of the morning, the two pilots were originally assigned convoy escort. However, shortly after leaving Al Asad the pilots were instructed by the Marine Corps Direct Air Support Center (DASC) to fly to a site southeast of Fallujah to support Marines on the ground tracking insurgents after an ambush.

Once on the scene Capt Bucklew used his Litening II FLIR/LST targeting pod to monitor a house that insurgents were thought to have fled into. At this point the pilots were cleared by a Forward Air Controller (FAC) to attack the house with a laser-guided AGM-65 Maverick missile. Maj Berry duly illuminated the target with the laser fitted in his Litening II pod while Capt Bucklew began his missile run from north to south. His weapon struck the target with clinical accuracy.

Moments later the Litening II pod's FLIR detected the heat signatures of insurgents entrenched around the house, and Maj Berry alerted the Marines to their presence – they were soon located and routed out. Other insurgents fled in a vehicle, which the Harrier II pilots followed from a discreet distance using their FLIR. Having seen the vehicle park near another house, Maj Berry related this information to Marines on the ground.

Instructed to maintain surveillance on the enemy throughout the mission, the pilots took it in turns to 'yo-yo' out to a tanker to refuel. After a long mission that lasted nearly six hours, and saw each Harrier II visit the tanker four times, Maj Berry and Capt Bucklew were eventually relieved and flew back to Al Asad shortly after sunrise *(Cover artwork by Gareth Hector)*